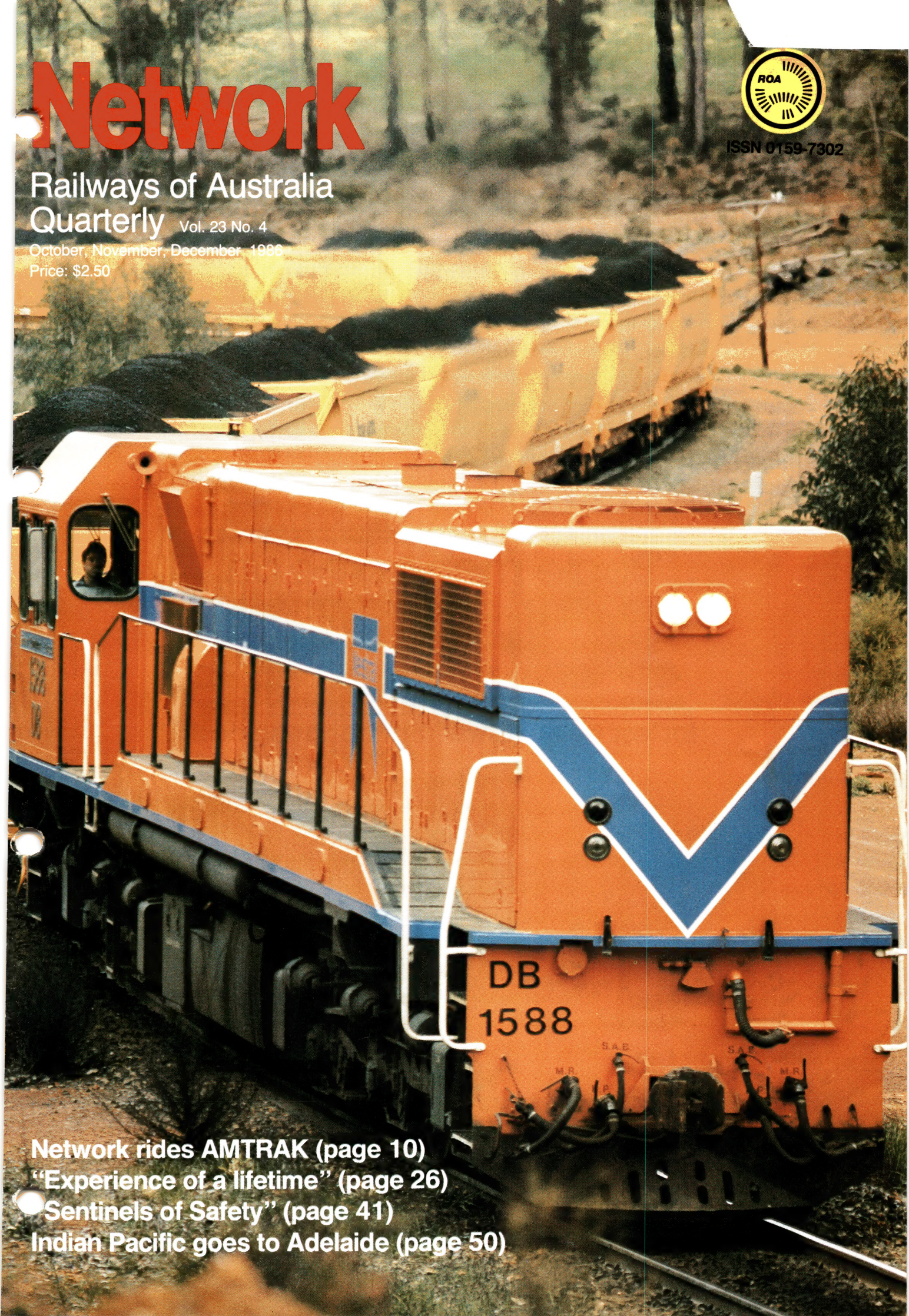
Network

Railways of Australia Quarterly

Vol. 23 No. 4
October, November, December 1986
Price: $2.50

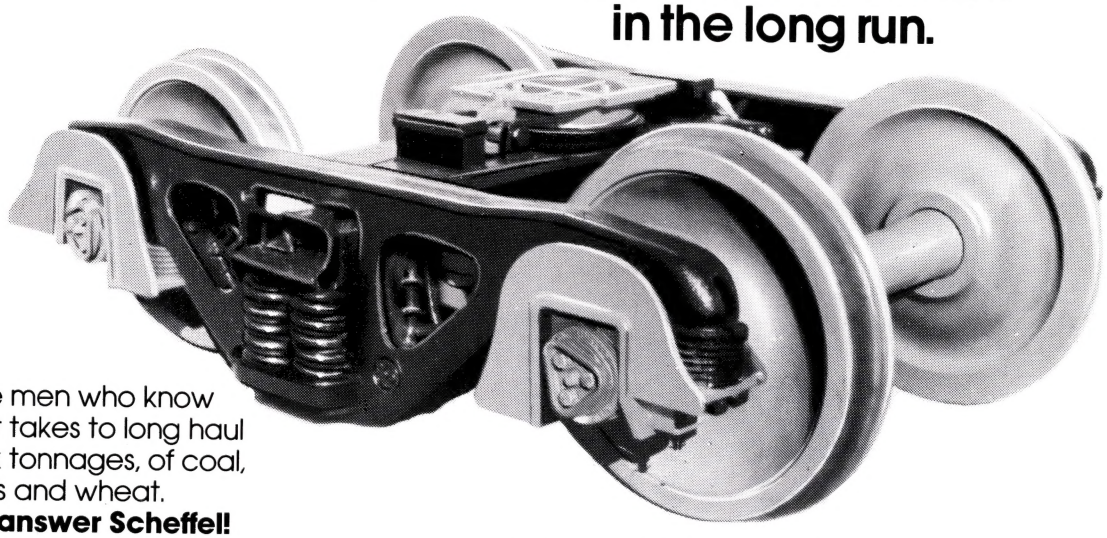
ISSN 0159-7302



Network rides AMTRAK (page 10)
"Experience of a lifetime" (page 26)
"Sentinels of Safety" (page 41)
Indian Pacific goes to Adelaide (page 50)

'Bogie' men agree on SCHEFFEL

for less wear – lower maintenance costs in the long run.



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Railways of Australia Quarterly
Vol. 23 No. 4
October, November, December 1986
Published by the Railways of Australia Committee, 4th Floor,
85 Queen Street, Melbourne 3000.
Temporary telephone number
(03) 67 9916.
Telephone number from October 1986
(03) 608 0811
Railways of Australia is an association of the government-owned railway systems, comprising:
Australian National • The State Rail Authority of New South Wales • Queensland Railways • State Transport Authority - Vic • Westrail
Editor: Alex Greig

Advertising Enquiries:

Advertising Enquiries to be addressed to The Advertising Manager, Railways of Australia 'Network', 4th Floor,
85 Queen Street, Melbourne,
Vic. 3000. Temporary telephone number (03) 67 9916.
Telephone number from October 1986
(03) 608 0811
or the following State representatives:

N.S.W.: Patrick Carr, Commercial Union Assurance Building,
109 Pitt Street, Sydney,
N.S.W. 2000.
Tel. 232 1026, 232 8072

Qld.: International Media Services, (Aust.), P.O. Box 190,
East Brisbane 4169.
Tel. (07) 393 0758

S.A.: Market Media Associates,
79 McLaren Street, Adelaide,
S.A. 5000
Tel. 223 6344, 223 6629

W.A.: Wilson's Editorial Services,
P.O. Box 40, Mirrabooka 6061
Tel. (09) 349 5798

Contributions:

Articles, news and/or photographs (with captions) — covering any phase of rail activity are invited for consideration by the Editor, R.O.A. Network, 4th Floor, 85 Queen Street, Melbourne 3000.

Subscriptions:

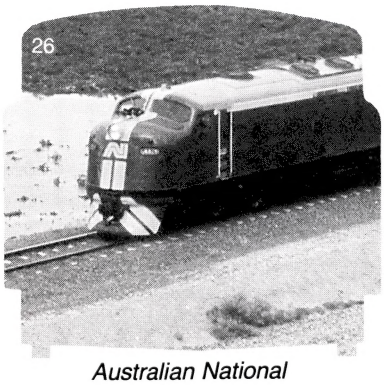
Within Australia, $12 per annum (posted). Overseas, A$16 per annum (surface mail).

PROUDLY PRINTED IN AUSTRALIA
BY LITHOCRAFT GRAPHICS, SOUTH MELBOURNE

State Rail Authority of N.S.W.

Westrail

V/Line



Australian National

STA of South Australia

Contents

Front Cover:

Two trains a day supply the Worsley Alumina Refinery with coal from Collie, in the south west of Western Australia. (Photograph courtesy Westrail)

Our only requirement of writers and personalities who contribute to Network is that they be informative or entertaining and that their subject has relevance to the wide interests of railwaymen today. Naturally, there will be occasions when their viewpoints or opinions run contrary to those of the editor or to Railways of Australia. We must accept that these differences are among the elements essential to the presentation of a lively and interesting magazine.

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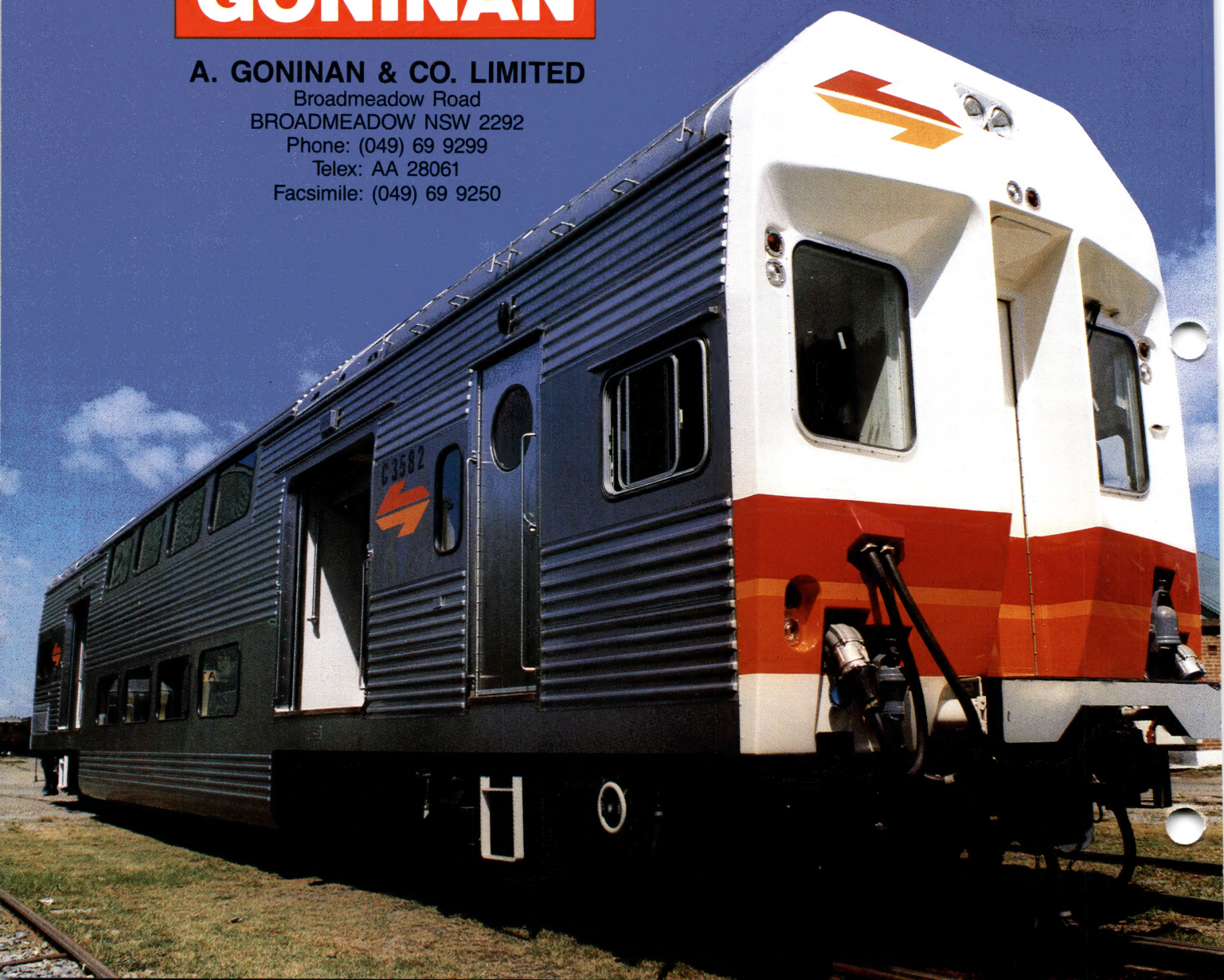

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The
EXECUTIVE DIRECTOR'S
column

Rail, Road and the Inter-State Commission

Australia's railways have had an interesting and long-standing connection with the Inter-State Commission — indeed, we could almost claim to be one of its progenitors.

The fathers of the Australian Constitution, in creating that document, said "there shall be an Inter-State Commission . . ." and "The Parliament may . . . forbid, as to railways, any preference or discrimination . . ." (but) " . . . no preference or discrimination shall . . . be taken to be undue and unreasonable . . . unless so adjudged by the Inter-State Commission". The rail industry was, therefore, to be one of the Commission's chief tasks, in an era when long-distance road transport did not exist.

The Commission itself, of course, has had a somewhat chequered career — established, disbanded, legislated for, and re-created in its present form in 1983.

A task given to the Commission by the Federal Government in 1985 was to "investigate in so far as interstate transport is concerned" the current level of recovery of Government costs through revenues attributable to the use of Australia's roads by freight and passenger vehicles engaged in interstate trade, and similarly the cost recovery level in interstate rail freight and passenger services.

In a report published in April 1986 the Commission stated its " . . . fundamental conclusion that the cost recovery ratio for interstate road transport substantially exceeds that for interstate rail".

Quoted baldly, this might be interpreted as meaning that rail is unfairly "subsidised" at the expense of its road freight and passenger competitors. I bellieve that this is far from the truth, and that we should be wary of reaching wrong conclusions as a result.

In its 575-page report, the Commission makes a large number of assumptions. Any body concerned with transport costing must do so — all forms of transport infrastructure produce joint outputs. Thus, roads are used by all forms of traffic — private, commercial, passenger, freight. Rail lines carry both passenger and freight traffic locally, long-distance and between States. The correct apportiontment of infrastructure costs (capital and maintenance) **between** these outputs is difficult, and this is where the assumptions come in.

The Commission has used its best judgement, relying on data from studies throughout the world, in making the assumptions which have led it to its conclusion. But it is the need to make assumptions which clouds the finite issues.

And there is one **absolute** fact needing no arbitrary assumptions, of which our community needs to be aware. **All** of **rail's** infrastructure costs are included in the industry's trading results — the quantum is there for all to examine. The **split** of that quantum between traffics is open to interpretation, as Australia's rail systems assisted the Commission to do. But the total is not in dispute.

The same cannot be said for the road freight industry. The Commission quotes an estimate prepared by the Bureau of Transport Economics: in 1984-85 Australia spent $2057 **million** on constructing and maintaining arterial roads **only** — local roads are excluded.

By what factors would the $2057 million spent on just **some** of our roads be reduced if roads were designed and mantained for private motor traffic only? If this cost could be determined, then the balance of costs belong to the road freight and passenger industry — local, long-distance and interstate. And that balance of the costs is the amount which should be borne wholly by the commercial road transport industry, and against which recovery should be measured.

The Commission's duty was to examine only the interstate sector of Australia's transport task. Cost allocations between sectors will always require assumptions and judgement.

But when rail and road cost recoveries are being compared, a clear, equitable and common basis for such an evaluation is needed. I need to be convinced that the Commission has achieved this.

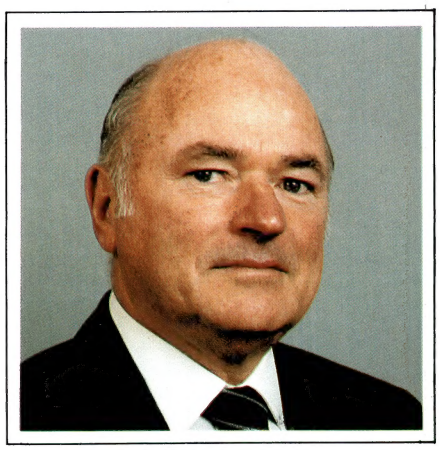
The Commission also chose to ignore "external costs", including the cost of road accidents estimated at $3 **billion** by the Federal Office of Road Safety.

Rail bears its own costs for accident prevention and safety measures; our accident record is fortunately a good one.

Repeating — rail's total costs are finite. I doubt that the total costs attributed to commercial road freight and passenger have the same clarity, and until this is achieved, comparisons between rail and our competitors require great caution.

Michael Schrader

M. C. G. SCHRADER
EXECUTIVE DIRECTOR



M. C. G. Schrader

XPT two millionth passenger, Mrs Heather Robins from Albury, cutting the cake with Mr Pat Johnson, Acting Chief Executive, to celebrate the occasion.

XPT's '2 millionth' Birthday

An Albury Biochemist received a welcome and unexpected birthday gift recently.

Mrs. Heather Robins arrived at Sydney's central railway station just before midday August 1, to discover she was the two millionth passenger on the country supertrain, the xpt.

Heather, returning to Albury after visiting her parents at St. Ives for a week, was greeted with a gift basket and prize of a trip for two on another prestige train — the Indian Pacific to Perth.

Together with state rail acting chief executive, Pat Johnson, Heather cut a giant cake marking the occasion.

And a jazz band turned in with the appropriate music.

Heather chose August 1, to return to Albury to celebrate her birthday with her husband Brian.

She is a regular passenger on the xpt.

Heather celebrated with other passengers on the Riverina xpt all the way home.

After a champagne party at central with other passengers, she was greeted at official parties of Goulburn, Wagga and Albury stations, with media and local dignitaries and guests.

Presenting Heather with her prizes, Mr. Johnson said it was a proud "occasion" for State Rail.

"The xpt has been a tremendous success story," he said.

"The first train was introduced only four years ago, and today we celebrate carrying our two millionth passenger.

"We look forward to continuing success."

The first xpt service, to Dubbo, was introduced on April 8, 1982.

There are now six xpt services, to the North coast, Northern Tablelands, Riverina Central West and Canberra.

The capacity of the current xpt services will be increased later this year when the first of 12 new carriages come into service.

The calling of tenders for 14 additionally high performance trains was also announced by the state government earlier this year.

'Two year countdown to profit' - Westrail

Westrail Commissioner Ian McCullough called for a renewed commitment to a commercial Westrail at his annual briefing.

His message; that commercial targets are being met in all areas of the organisation, but that the ultimate goal of eliminating losses from our balance sheet is still not within sight. A further loss reduction of $26 million must be made if Westrail is to break even under "Competitive Westrail" conditions by June 1988 — just two years from now.

The briefings, hosted by the Commissioner for senior managers, and union representatives also this year, set out Westrail's plans and operational innovations in the planning pipeline.

This time the audience heard how:

- the amount of freight traffic has begun a gradual decline which is expected to last four years. A revival of the depressed ores and minerals industries may reverse this decline towards 1991.
- a base-to-mobile radio network is being evaluated. This could cover much of the Westrail system, bringing a change to train orders from the present staff train control methods.
- production control will come to the Midland workshop.
- the track has now virtually reached target axle-loadings, where only fine-tuning will be required to keep it in peak-efficient condition.
- further dramatic reductions in the number of locations serviced are in hand.

The item that escaped no one's attention was the planned reduction in staff numbers of about 1,200 by mid-1988, bringing the total down to 5,600.

The process of achieving this reduction is yet to be decided, the audience was told. However, the reasons why the reduction is necessary were made clear.

Stretching towards the planning horizon of 1991 is a sequence of losses hardly budging from last year's expected loss of $59 million in the conventional Government reporting terms. But things are better than this.

Westrail has begun to assess its financial performance in fairer and more commercial terms than conventional government accounting practices, he said. On the commercial accounting basis the current loss is

Westrail's Commissioner of Railways, Ian McCullough

$28 million, not $54 million. This is good but must reduce to nil before June two years from now.

The reality is that very little reduction from the present loss is possible if Westrail carries on the way it is now going. Only much too late, in 1991, is a profit in sight and the profit possibility is based on the risky assumption of a revival of the ores and minerals industries to Westrail.

Clearly the briefing audiences heard that Westrail cannot keep going the way it is, meeting annual budget targets and not breaking through to profitability.

New venture is a crushing success

Westrail's diversification into commercial enterprise took a major step forward in June with the opening of the Western Quarries joint venture. Commissioner Ian McCullough is chairman of the venture, which is operated by equal partner Quarry Industries, a Boral Company.

At the official opening, Mr. McCullough said Western quarries was symbolic of the future Westrail was planning for itself — businesslike and profit making. "It is based upon the haulage of heavy goods in bulk and it makes excellent use of the resources that railways can provide best," he said.

Westrail's design and construction of the special 69-tonne bottom-dump wagons being used to rail the aggregates from Toodyay to the Kewdale distribution centre was one example of the new businesslike Westrail, he said.

Westrail also supplied the fabricated steelwork for both the quarry and distribution centre.

It was also emphasised at the opening ceremony that the combination of the quarry, rail haulage and the Kewdale distribution centre balanced economic development and environmental considerations.

The quarry will supply high quality crushed granite and dolerite rock from the 570 hectare freehold site. Crushing and grading of the rock is carried out by a high efficiency plant located less than 200 metres from the railway line in the Avon Valley.

The actual processing plant has a capacity of 250 tonnes of finished products per hour.

Commissioner Ian McCullough, member for Moore, Bert Crane, and the mananging director of Quarry Industries Ltd., Bernie Leverington.

The clip

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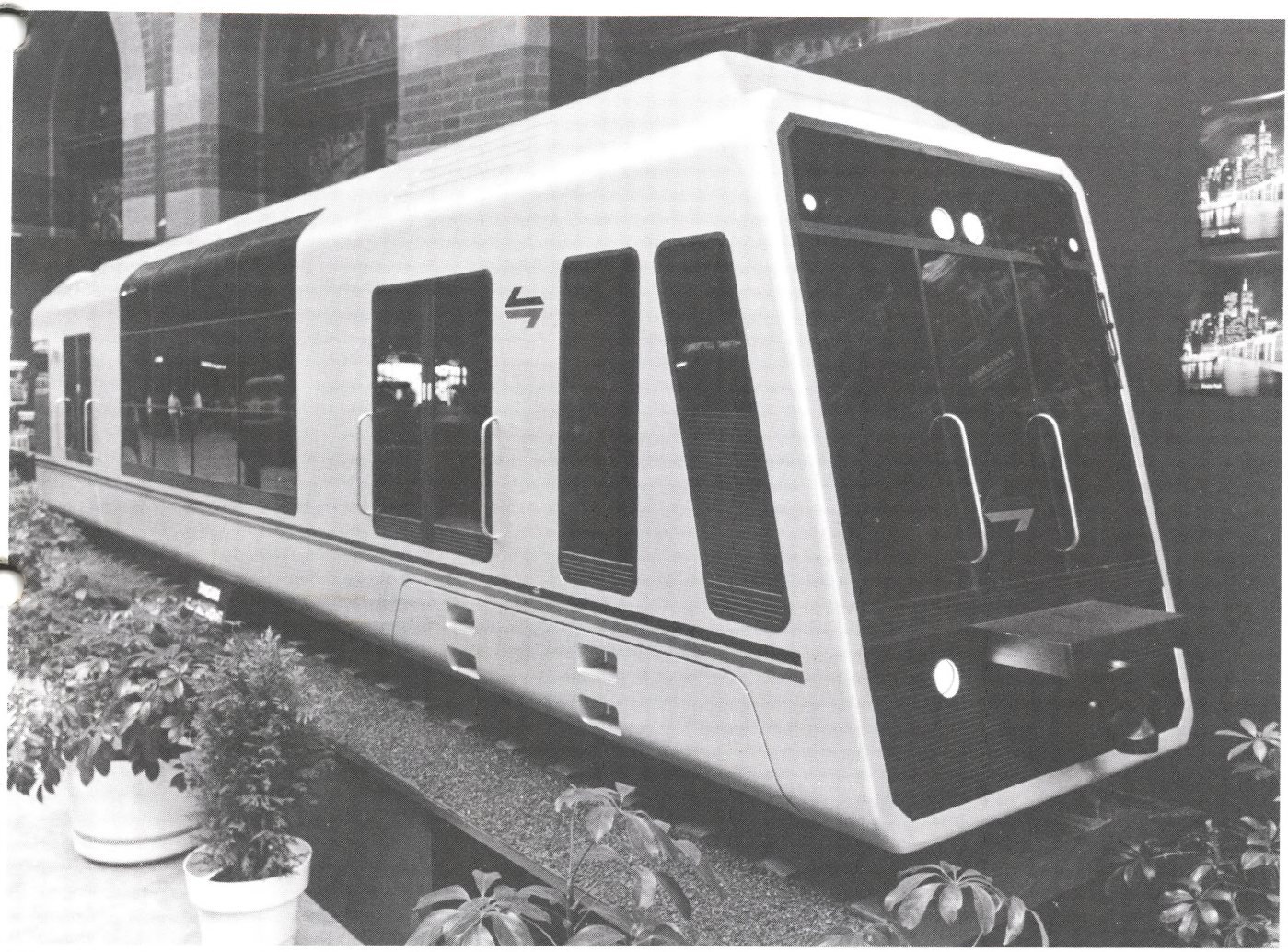


Tangara model at Sydney Central

TANGARA UPDATE...

The N.S.W. Government has approved a recommendation from the State Rail Authority for the biggest passenger train contract ever let — the new Tangara.

N.S.W. Premier, Mr. Barrie Unsworth and the Deputy Premier and Minister for Transport, Mr. Ron Mulock said the new Tangara electronic train would revolutionise the Sydney suburban system.

Its introduction would result in removal from the network of the remaining "red rattlers" with a corresponding increase in overall reliability.

The Government has agreed to letting of a contract worth $489 million for 450 of the Tangara carriages.

The contract is expected to provide jobs for 1200 over the next eight years and make Sydney's suburban rail system second to none in the world.

Recommended contractor for the work is A. Goninan and Company Limited.

Goninan will be responsible for work on the project including construction of the carriage bodies.

The company under the direction of the SRA also will be responsible for sub-contracting work to other companies including manufacture of components such as seats, air-conditioning, windows and some electrical equipment.

Goninan also will negotiate sub-contracts, under the direction of the S.R.A. with Clyde Engineering, for motor bogies and traction motors and Comeng, for trailer bogies.

The modernistic features of the Tangara have already been featured in "Network," and we shall continue our reports on the project as its progresses.

Many of them are gone — those glamorous long-distance American trains about which we read in our youth, and which we saw on the movies.

Often referred to as "the varnish," from the days when passenger cars were varnished on the outside, the luxurious air-conditioned streamliners of the pre-World War II era have vanished from many parts of the United States.

The Empire State Express, The Los Angeles Limited, The Twentieth Century Limited, are now but a memory.

However, others live on, in a very much modernised and revitalised form — The Broadway Limited, The Crescent, The Sunset Limited.

And the change is due to the emergence of something which, twenty years ago, was almost unthinkable in that bastion of private enterprise — the U.S.A.

It is a government-operated long-distance rail passenger service — known as Amtrak.

This year, 1986, the National Railroad Passenger Corporation (to give Amtrak its legal title) celebrates 15 years of existence.

They have not been easy years, and problems continue. But based on Network's experience, they are well on the way to being solved.

So — what is Amtrak really like? How does it stack up against pre-conceived notions of luxury long distance rail travel, conjured up by names like The Chief, The Olympian Hiawatha, and The Coast Daylight? What do the facts and figures show?

Amtrak — The Creation

Firstly, a little background. In 1929 the railroads of U.S.A., operating 20,000 passenger trains, carried 77 percent of intercity passenger traffic by public mode in the United States.

Buses carried 15 percent, and the airlines served an immeasureably small number.

By 1950, more than half the passenger trains had disappeared, and the railroads' share of the intercity passenger traffic had declined to 46 percent.

In the meantime, traffic on buses increased to 38 percent and the airlines' share had grown to 14 percent.

Twenty years later, in 1970, railroad passenger traffic dropped to 7 percent of the commercial share and the number of trains still operating was less than 450.

Of these, about 100 were in the process of being discontinued and many were operating with only one or two passenger cars.

Airlines dominated the public carrier market with 73 percent, while buses, still in second place, held onto barely 16 percent.

There was a substantial growth in automobile traffic throughout this period.

By this time, it was increasingly recognised that the country's excessive reliance during the past four decades on the private automobile and the aeroplane for intercity travel had left the nation with a serious imbalance in its transportation network.

Creation of a national rail passenger system was viewed as a method to save an alternate form of transportation that possessed a priceless asset — existing tracks and rights-of-way into the major population centres of the nation.

These rail facilities could be upgraded quite economically when compared to the costs for construction of new highways and airports.

The Rail Passenger Service Act, enacted on October 30 1970, created Amtrak and specified that a Board of Incorporators consisting of eight Presidential appointees would be formed to organise the corporation.

The incorporators were faced with enormous tasks when they began work on January 1 1971, just four months before the obligation to operate rail passenger service would be transferred to Amtrak.

They had to begin organising what was comparable to a $200M public

service corporation; to decide what specific routes should connect the 21 pairs of cities designated by the Secretary of Transportation; and decide what trains, frequencies and type of service to be operated effective May 1.

The incorporators sought out full-time professional help. A management consulting firm was hired to develop the organisational structure as well as provide interim staff support until the Corporation could hire its own personnel.

Two executive search firms were put to work to find management prospects.

Lawyers began drafting articles of incorporation and numerous contracts needed for train operations.

Engineering experts inspected and surveyed available passenger

NETWORK R

Speeding through the Northeast Corridor after a snowfall — an Amtrak Metroliner hauled by an AEM-7 10,000 h.p. electric.

terminals, cars and locomotives. A major airline was asked to study and make recommendations on a nationwide ticketing and reservations system.

A national public relations agency, along with an advertising agency, was retained to help promote increased passenger traffic.

Up until this time, the Corporation had been commonly known as "Railpax." A leading design firm was retained to develop a new name, and Railpax became "Amtrak," for America, travel and track.

Objectives of the New Corporation

The underlying thrust of Amtrak's first efforts was gradually to revitalise public confidence in rail passenger service through improvements in service and comfort to induce the travelling public to return to train travel.

The Corporation began with some specific goals: To improve employee courtesy and service to the public; to offer reliable performance and better-maintained equipment; and to issue accurate information to travellers.

Most of all, Amtrak developed positive programs to entice an increasing share of the travel market to train travel.

The principal target: those travellers who relied principally on the private automobile for intercity trips, which at that time represented 87 percent of the intercity travel market.

Amtrak's First Days

Beginning May 1 1971, Amtrak assumed responsibility for managing intercity passenger train service over 23,000 route miles, an extensive system by railroad standards.

Actual train operations continued to be performed by the railroads under contract with Amtrak.

On Amtrak's first day of operation, it inherited an antiquated business.

With passenger losses steadily increasing, the railroads had little or no incentive to maintain or modernise equipment or facilities.

Not one railroad operated a modern computerised reservations system and many of the passenger cars were old and in disrepair.

Too many of the stations and maintenance facilities had become unsightly after years of neglect and were inefficient to operate.

DES AMTRAK

When Amtrak first offered service, it did not own any railroad tracks, stations, terminals, yards, repair facilities, locomotives, passenger cars or other railroad assets.

At that time, there was not one manufacturer in the United States with an open production line for intercity rail passenger equipment because no such equipment had been purchased for years.

For the first two years, Amtrak was almost totally dependent on the private railroads, leasing equipment from them and using their facilities.

An Amtrak customer could make a reservation, buy a ticket and complete his journey without ever coming into contact with an Amtrak employee.

Congress had given Amtrak only a two-year experimental period of life, and planning future improvements was excruciatingly difficult.

In its initial route structure, Amtrak trains began operating over the tracks of 13 railroads.

In return for being relieved of the responsibility for operating passenger trains, each of the 13 railroads agreed to pay Amtrak 50 percent of its passenger service loss for the year ending December 31 1969.

The railroads had the option of paying cash or contributing equipment or services of the same value.

The railroads could also elect to receive common stock for the value of these payments rather than taking a tax write-off.

Four railroads — Burlington Northern, Milwaukee Road, Grand Trunk Western and Penn Central — accepted the stock option and were permitted three representatives on Amtrak's first Board of Directors.

Three railroads — the Denver and Rio Grande Western, the Rock Island, and the Southern — continued to operate their own passenger trains and did not join the Amtrak system.

After January 1 1975, these companies were free to petition appropriate regulatory bodies to discontinue service, and today all three are out of the passenger business.

The Rock Island went out of the passenger business in 1979.

Amtrak assumed the operation of Southern Railway's popular "Southern Crescent" in 1979, and D & RGW's scenic Zephyr route through the Colorado Rockies in July 1983.

Today Amtrak is the only intercity rail passenger carrier in the United States and is the United States' 6th largest public carrier in numbers of passengers carried.

Steps Forward

The OPEC oil embargo in 1973 and 1974 shook the nation's transportation complacency, and Amtrak ridership increased by two million passengers between 1972 and 1974.

In 1973, Amtrak received its first new intercity rail passenger equipment.

Because of the immediate need and the long lead-time involved in ordering domestically produced rail passenger equipment, and the ready availability of imported equipment, Amtrak's first new car order was for six French Turboliner train sets.

The public reaction to the new equipment was positive, and, in 1973 and 1974, Amtrak placed an order with an American manufacturer, the Budd Company, for 492 "Amfleet" cars for use in a variety of applications.

In April, 1976, Amtrak acquired a major portion of the busiest railroad in the Western Hemisphere — the 456 mile Northeast Corridor from Washington to Boston.

At the same time, Congress passed the Railroad Revitalisation and Regulatory Reform Act, which authorised the expenditure of $2.5 billion to rebuild the Corridor.

Work began in 1977 on the Northeast Corridor Improvement Project, a program which has permitted Amtrak trains to reach speeds of 120 mph and operate its Metroliner Service trains on two-hour-49-minute New York-Washington schedules with a 90 percent on-time performance record.

Also in 1977, an order was placed for 284 long-distance bi-level passenger cars which revolutionised long-distance train equipment.

Amtrak improved its maintenance facilities and developed one of the finest passenger train maintenance forces worldwide.

The company's Beech Grove, Ind. heavy maintenance facility gained a reputation for innovation and quality work when engineers and workers there developed a method of totally rebuilding old steam heated passenger cars to all electric head-end power (HEP), a system in which all hotel power, such as heating and air conditioning, is supplied by the locomotive.

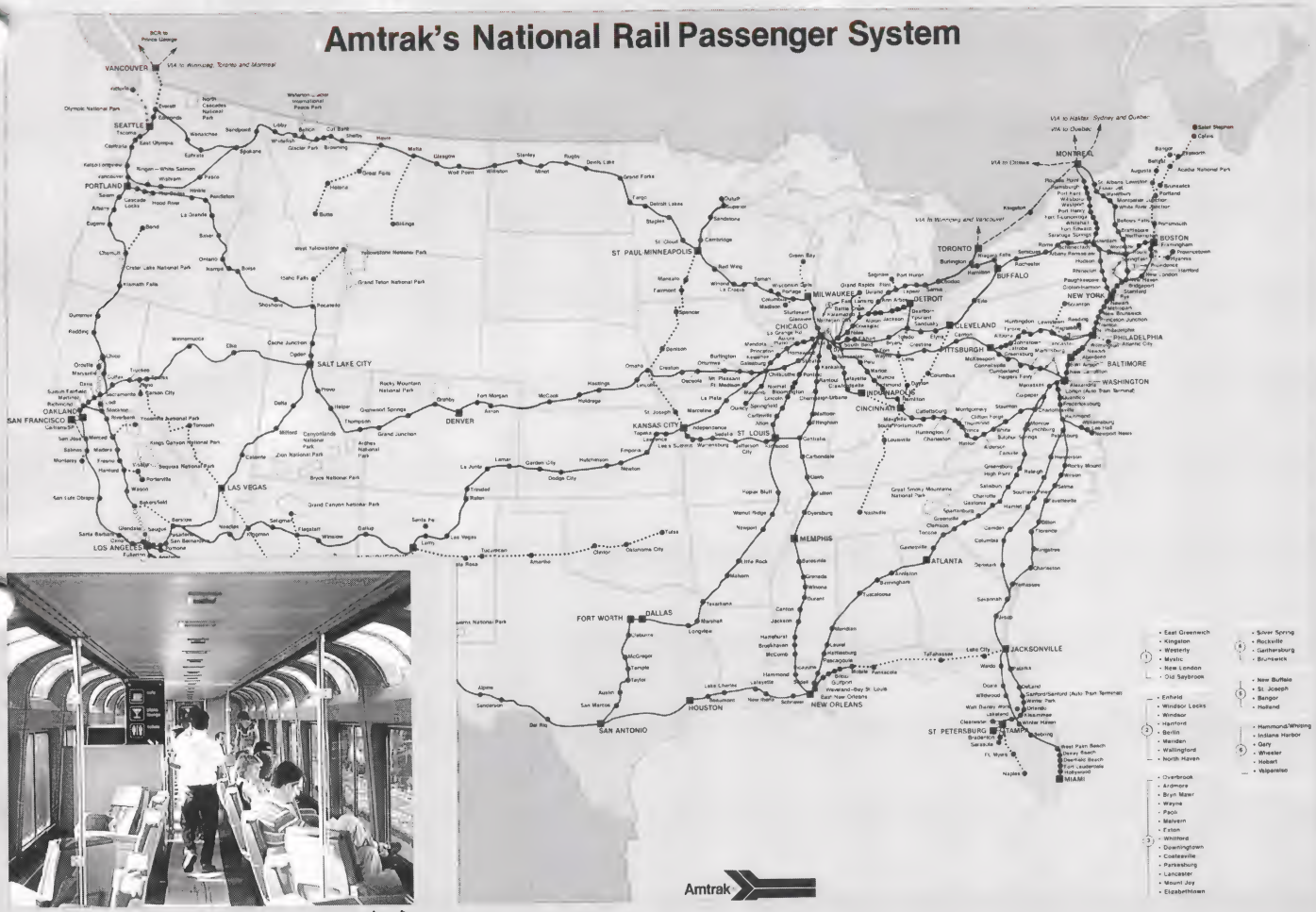
The HEP program has drastically reduced the incidence of air conditioning failures and extended the useful life of many of Amtrak's older passenger cars.

The year 1982 saw Amtrak's entire operating fleet of 1,500 cars utilising new or completely rebuilt, head-end powered passenger equipment.

In addition to upgrading train equipment and installing a nationwide computer controlled reservation and ticketing system, Amtrak has led the U.S. railroad industry in negotiating revolutionary new labour contracts.

In 1983, Amtrak began direct employment of its engineers and conductors on its Northeast Corridor runs.

Interior of new Budd-built car body shell, prior to fitting out as either sleeping or dining car.



Amtrak Superliner lounge car, upper deck

The California Zephyr changes crews at Grand Junction, Colo. Two F40PH diesel electrics; two Heritage baggage cars; Hi-level coach/crew dormitory car; Superliners.

Amtrak e.m.u. now used on the Philadephia-Harrisburg service. These units were the prototype for AMFLEET.

Part of the new agreement called for operating crews to be paid on the basis of an eight-hour-day rather than the mileage basis of pay which had been the industry standard of many decades.

The annual savings for the new agreements were approximately $20 million.

During 1986 and 1987, Amtrak will be taking over direct employment of engineers (drivers, observers) and conductors on most trains outside the Northeast Corridor, with additional annual savings expected to be $20 to $30 million.

Business improvements, combined with strong marketing of the company's vastly improved product, have permitted Amtrak to increase its cost recovery and reduce its dependence on Government subsidies.

In the four years to 1985, Amtrak's revenue-to-cost ratio rose from 48 percent to 58 percent. The revenue-to-cost ratio is expected to reach 61 percent in 1986.

Amtrak's ridership and revenues tell the story.

In 1972, the first full year of Amtrak operations, the company carried 16.6 million passengers. In 1985, Amtrak carried 20.8 million passengers. Passenger miles rose from 3 billion to 4.8 billion during the same period.

Revenues rose from $162.6 million in 1972 to $825.8 million in 1985, the highest in the company's history, and systemwide on-time performance rose from 76.2 percent of trains on time to 81 percent.

Amtrak Today

So much for history and background.

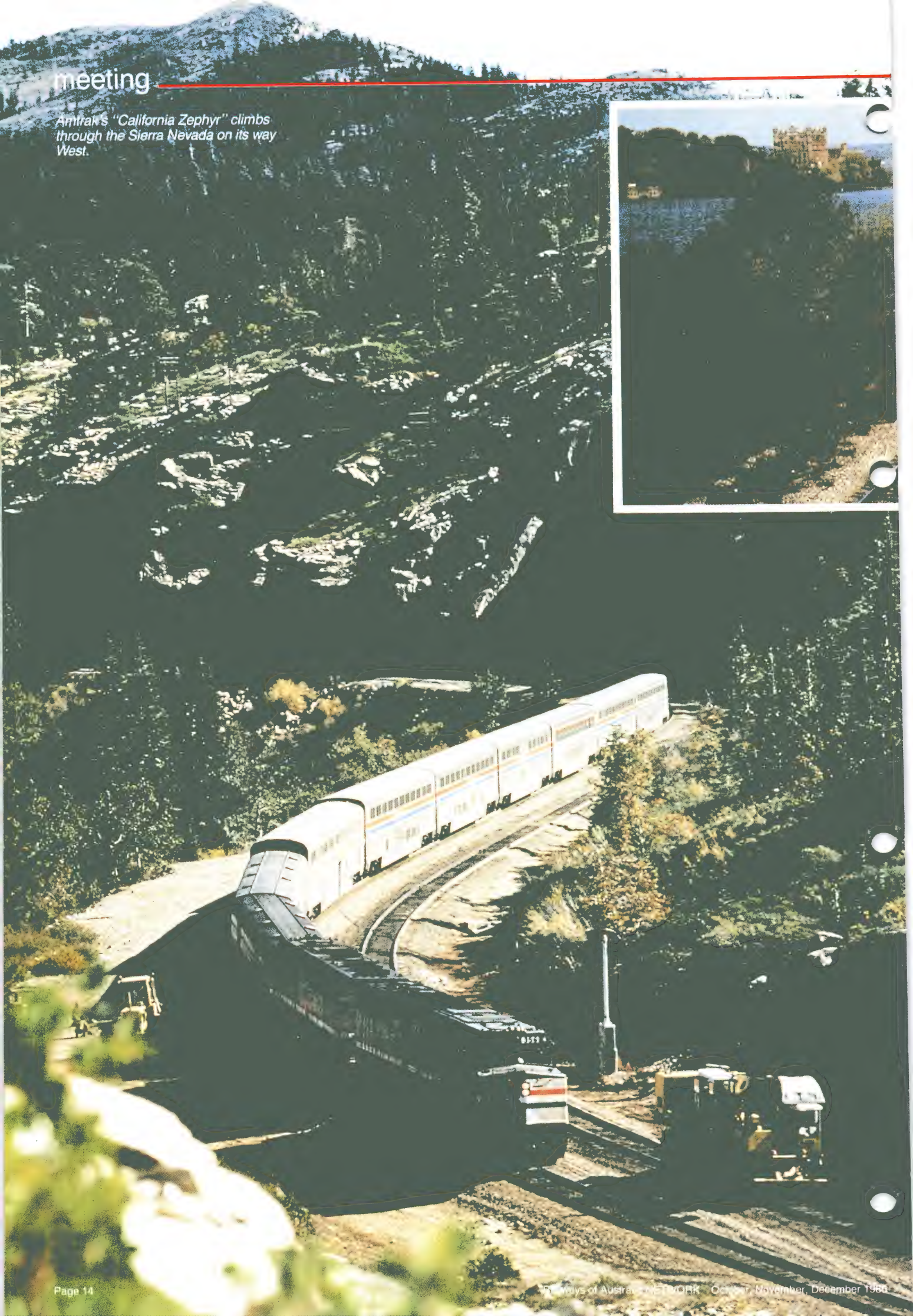
What of Amtrak today, and the impression it makes on its passengers and public?

We can distinguish four different variants of Amtrak's operations.

The Northeast Corridor: Between Boston, Mass. and Washington, D.C., Amtrak operates a frequent service of high-seating-density passenger trains over a route that is largely electrified.

meeting

Amtrak's "California Zephyr" climbs through the Sierra Nevada on its way West.



Amtrak Rohr-built "Turboliner" skims the shore of the Hudson river, New York, on the Empire Corridor.

Speeds are high, and traffic is heavy. Regular coach class services are supplemented by extra fare Metroliners offering higher speeds and greater comfort. Night sleeping car services are operated.

Between New York City and Washington, Amtrak offers more seats per hour than does the competing airlines' shuttle service.

Long Distance: Over major trans-continental routes and North-South services, Amtrak offers a basically daily service including the modernised contemporary versions of The Broadway Limited, The Lakeshore Limited — and revised and renamed trains such as "The California Zephyr." Dining and lounge facilities are provided on these coach/sleeper trains.

Other Corridors: On selected corridors such as Los Angeles-San Diego, and the Empire Corridor between New York City, Albany and Buffalo, Amtrak also operates a service frequency greater than daily.

It is on the Empire Corridor that high speed "turboliner" trains are operated.

403(b) Services: Under its enabling act, Amtrak is allowed to receive funds from individual States subsidising particular trains which would not otherwise meet revenue criteria.

Similarly, under contract, Amtrak operates commuter style services from certain cities, notably on the East Coast.

Impressions: "Network's" Amtrak experience began at Boston's South Station — at the northern end of the Northeast Corridor.

The 12.30pm "Minute Man," destined for New York City and Washington, was a typical Northeast Corridor consist — five Amcoaches and an Amclub.

This last trailing vehicle has 18 Club Class and 23 Coach seats. A centrally-located cafe section provided food and beverage service.

All vehicles are part of Amtrak's "Amfleet," the name given to the cars ordered from the Budd Company in 1973/74, and placed in service 1975-1977.

Their origins derive from the "Metroliner" e.m.u. cars operated by the Pennsylvania Railroad between New York City and Washington D.C., prior to Amtrak's advent.

This Metroliner equipment was one of the few ventures made by American Railroads into new style passenger equipment in the post World War II period.

The somewhat tubular shape of the Amfleet gives the cars a distinctive appearance, and their window configuration is such that one's view is a trifle narrow.

Even with close seating configuration, there is ample room, and each car has modern luggage racks.

Amtrak retains the typical North American approach to revenue collection — the conductor checks all tickets and in return issues a passenger check which he places in the luggage rack above the seat, to indicate that it is occupied to a particular destination.

The passenger check itself provides for identification of the destination.

On the Minute Man, the cafe section provided very adequate snacks including hamburgers and cheeseburgers prepared in a microwave oven and there was much to see as the train speeded south.

Food preparation area, Amtrak Superliner dining car. Cooking ranges at left.

In Providence, capital of Rhode Island, the domed Capitol building is very close to a new station being developed to serve the city —with the main line straightened from its former curving course.

There are plans afoot to develop the Old Saybrook Station into a shopping complex on the site. And glimpses of the coastline and sea are frequent.

At New Haven, the electrified trackage began and our F40PH diesel-electric was replaced by a 6000hp E60CP.

Here, all along the Corridor, and indeed in the approaches to passenger stations in most US cities, is evidence of reduction and contraction in passenger trackage.

Passenger stations with multiple platforms have been reduced to two or perhaps four; on the Corridor, multiple trackage has been reduced. All steps are part of a need to dispose of unwanted infrastructure-equipment and contain operating costs.

Southwards from New Haven, Amtrak's trains mingle with those of the Connecticut Department of Transportation which operates commuter services over this route, formerly the New York, New Haven and Hartford Railroad.

After Stamford however, Amtrak trains diverge east and cross the East River over a spectacular long bridge high above the water.

The tracks of the former Long Island Railroad are joined for entry to New York City at Pennsylvania Station.

After a stay in the area, a ride in the cab of a Metroliner south towards Philadelphia was a highlight of the Northeast Corridor experience.

Today's Metroliners are powered by Amtrak's AEM-7 electric locomotives, 10,000hp, one-man operated, with an Amfleet consist.

With the protection of cab signalling, trains operate at speeds up to 120 mph, and we certainly achieved this on more than one occasion.

From the cab, the tremendous task which Amtrak has done in upgrading the track on the Northeast Corridor is immediately apparent. Most of the centre pair of tracks is welded rail on concrete sleepers and, in a reversal of form, Amtrak provides right-of-way for freight trains over its tracks on this section.

Amtrak Superliner coach car, showing two seating levels. The height of the equipment is obvious.

As on all railways, track maintenance is an ongoing problem — and it was possible to detect in advance discoloured sleepers, indicating water seepage, and a consequent "hole" in the track.

The AEM-7's, built by Budd with Swedish ASEA electrical componentry, are an impressive machine.

Seventy minutes only New York City to Philadelphia, with an intermediate stop at Newark, are allowed for Metroliners — and it is not hard to understand why Amtrak has the major share of commercial business transport on this sector.

Likewise, south of Philadelphia, the major centres of Wilmington and Baltimore are served prior to arrival at Washington Union Station.

Thirty-fourth Street Station in Philadelphia is another example of an old building tastefully restored for Amtrak service. Amtrak's Passenger Services counter has, for passenger enquiry purposes, access to computer printouts describing the location and facilities available (hotels, hire cars, public transportation) at Amtrak locations throughout the country.

Washington Union Station is currently in the throes of redevelopment, providing better access to the lower-level platforms used by through, rather than terminating, services. Commuter trains operate into and out of Union Station, and Washington's Metro is adjacent.

The Crescent, Amtrak's successor to the Southern Railway's Southern Crescent provides a convenient overnight service between Washington D.C. and Atlanta Georgia.

As with overnight intercapital trains in Australia, The Crescent can serve as a hotel room on wheels — transport plus accommodation for little more than the airfare.

Comprising "Heritage" equipment inherited from various railroads, The Crescent conveys a dining car, a lounge car, coaches, and a variety of sleeping accommodation.

Its roomettes would be very familiar to Australian travellers who use the "Overland" between Adelaide and Melbourne; the styling is very reminiscent of early cars on that service.

Most of Amtrak's "Heritage" sleeping cars were built by the Budd Company in the late 40s and early 50s, and were rebuilt at Beech Grove carshops. They came from the Santa Fe, Southern Pacific, Union Pacific, Burlington and Seaboard Coast Line Railroads.

The lounge car is an interesting vehicle — it serves light meals from a bar at one end and provides tables for these casual meals as well as beverages. The aisle is central.

And so to an Amtrak dining car. In a cost-cutting measure some four years ago, Amtrak was forced to withdraw full dining car services from its trains and was severely criticised as a result.

On-board cooking has now returned, with modified staffing arrangements and the result is good. Prices are reasonable too by American standards — varying from $5.50 for vegetarian lasagne to $10.50 for a grilled New York strip steak (10 oz).

In line with American practice, that meal includes salads, roll and butter, tea/coffee. Desserts are priced up to a maximum of $2.25.

For the first class sleeping accommodation (which excludes slumbercoaches and economy bedrooms) Amtrak now includes all meals with the price of the sleeping car supplement.

Heritage equipment is also a feature of The City of New Orleans which links

New Orleans with Chicago. On this service, a cafeteria-lounge car provides the food service.

Booths are provided at one end of the car and lounge accommodation at the other — a small servery operating in the middle and using microwave facilities offers hot meals, light snacks and beverages.

Once again, the Train Captain manages to greet sleeping car passengers with their name.

The City of New Orleans is an overnight service and includes "a vista dome" coach in its consist.

Once very popular in the North American scene, there are now twelve operating in Amtrak service. Twenty seats in the dome section offer an all-round view — but this is somewhat restricted by the flexiglass windows which tend to discolour and scratch.

The experience, however, is rewarding.

All Amtrak services into and out of Chicago, a hub in the national network, are now concentrated at Union Station.

In previous days, railroads used a variety of stations in that city. In consequence, Union's facilities, albeit grandiose, are taxed — and redevelopment is planned.

On long-distance trains west of Chicago, Amtrak operates its Superliner equipment. A quote from Amtrak's description: "built by the Pullman Standard Company, these state-of-the art cars represent what can be done with a revitalised American railroad passenger car industry."

They owe much in design to the HI-level cars formerly operated by the Santa Fe Railroad, and now by Amtrak.

Coaches, dining cars, lounge cars and sleeping cars comprise the Superliner fleet, in various configurations.

Network left Chicago on train number 5, The California Zephyr westbound.

The main train goes to Oakland California (across the bay from San Francisco); there are additional portions conveying through cars to Los Angeles and to Seattle.

The California Zephyr divests itself of these portions at Salt Lake City — when the Seattle train becomes the Pioneer, and the Los Angeles train the Desert Wind.

North American practice permits access to departing trains only 15-20 minutes before scheduled time.

California Zephyr is always popular, and since peak travel time was almost upon us, there was a large crowd waiting to board.

Departure from Chicago was some minutes late as a result but the train was soon on its way over the flat plains which characterise Illinois. The 504 mile journey to Omaha Nebraska is scheduled to be covered in 8 hours 5 minutes — a notably high average speed over such a distance.

For most of this time, we sat in the upper deck of the Superliner lounge car with lounge seating, rotating chairs, and oversized windows which curved into the ceiling. The view is therefore somewhat similar to that from a dome lounge car.

On the lower level, a cafe unit offers food and beverage service.

Moving into the dining car for dinner, another advantage of the bi-level Superliner equipment is obvious. On the upper deck, the car seats 72, in two saloons of 36 each.

The entire lower floor is devoted to galley and storage space, with food being raised to the upper level in service lifts. The stainless steel kitchen area is, therefore, very spacious and very workable.

The basic dining car menu is the same throughout Amtrak, but fish and beef dishes are prepared in a variety of ways.

After dinner, when darkness had descended, another advantage of the Superliner lounge becomes apparent.

Its lighting is directed at the central aisle and has only minimal reflection on the windows.

In consequence, it was possible to see out from the train and make out the lights of passing towns etc.

Corridor connections between Superliner cars are at the upper level, which permits unobstructed use of the lower level in sleeping cars. This, in turn, provides space for a 4-berth family compartment across the entire width of the car at one end, with a specially-designed compartment for handicapped people at the other.

In between is a group of wash room/lavatories, aircraft style, and one group of economy bedrooms. The upper level comprises further economy bedrooms and a series of deluxe bedrooms, each of which has its own private shower.

Australians tend to notice the absence of shower accommodation on American long distance trains; it is only in the Amtrak Superliner deluxe bedrooms that these are featured.

Amtrak's passenger trains are notably smooth-riding and jolt free. The California Zephyr reversed into Denver Station 30 minutes ahead of schedule next morning, at 6.50.

Here, the locomotives are serviced and fuelled at the platform from a road tanker, and passengers can stretch their legs in the crisp mountain air which characterises this mile high city.

On leaving Denver, the Zephyr's passenger complement had built to over 500 people, with only three

(continued on page 18)

Amtrak Station, Galesburg, Illinois. The building was largely funded by the Galesburg community rather than by Amtrak itself.

(continued from page 17)

sleeping cars with a maximum accommodation of 132. This preponderance of coach accommodation as opposed to sleeping reflects the high (by Australian standards) premium charge for sleeping accommodation.

The slumbercoaches and economy bedrooms (as featured in Superliner equipment) are an attempt to reduce this premium. Certainly, the economy bedrooms are "economy"!

West of Denver, the spectacular ascent of the Rockies commences. With sweeping views, the climb culminates in the Moffat Tunnel, at an altitude of 9,300 feet.

En route there are definitive views of the zig-zags which were used by trains of the old Denver and Rio Grande Railroad prior to the construction of the Tunnel.

From the summit, the line descends through several mountainous gorges, affording picturesque and spectacular views of the Colorado River alongside it. Groups of young people were rafting down the river.

Westwards again through Glenwood, site of the world famous Colorado Hotel — and after leaving Grand Junction the train enters Utah. Here the countryside becomes more arid but always with mountains in the background.

There is a further big climb from Helper to Soldier Summit over the Wasatch Mountains.

On the descent from them, the train passes the site of the former village of Thistle in Spanish Fork Canyon which was totally eliminated by a landslide in 1983. This same landslide wrought great havoc on the Denver and Rio Grande Railroad requiring extensive reconstruction including a new tunnel.

That evening, the dining car staff served 266 dinners between 5.30 and 9.00 p.m.! The Train Chief commented that the dining car crew had worked particularly well, and there was certainly no evidence of rush.

Salt Lake City was reached at 10.30 p.m. and here the train divided. There was time to observe Salt Lake City Union Station, a former Union Pacific stronghold — with a magnificent vaulted roof and murals at each end, now a National Monument.

Shortly afterwards, the Zephyr passed the edge of the Great Salt Lake itself with moonlight rippling off the waters, and the wind-created-waves lapping at the shore.

The weather continued fine and clear as the Zephyr passed through Nevada next morning. Huge, trucking "rigs" rolled along the highway paralleling the track, and there was a large sprinkling of holiday-bound cars towing caravans.

We had been delayed during the night by a freight train in trouble, and we never recovered the lost time.

After a lengthy stop on the outskirts of Reno, we passed through that famous Little City itself — and then proceeded to climb the Sierra Nevada following the banks of the Truckee River.

The train circles Donner Lake to reach the summit at Norden, 7,000 feet. Here the line passes through a series of train sheds, including one which covers a turntable.

The descent is gradual to the West Coast from Norden down to Roseville, a most scenic track which is referred to as "The Hill."

The descent was gradual from pine-covered hilltops through mountain townships down to the flats, where the grass was browned and burned off as in an Australian summer.

Roseville is the site of extensive Southern Pacific Railroad facilities — a big freight yard and reconditioning and maintenance workshop.

Sacremento, capital of California, is an important stop. That State's most impressive Railroad Museum is located adjacent to the Amtrak station.

The plains around Davis are popular with hot air balloonists, and the Zephyr passes along coastal scenery near Martinez before reaching its terminus at Oakland California. From this point, Amtrak buses convey passengers to San Francisco itself.

"Network" rates a ride on a Superliner train as a most pleasant experience.

The Future

Like most other passenger services in the world, Amtrak loses money — $600M annually in round figures. Can it survive?

In each of the last two financial years, the Reagan administration proposed budget cuts which would have virtually eliminated Amtrak.

However, after negotiation, the American House of Representatives and Senate passed an Act which authorises funding for Amtrak until June 30 1988. The resultant Act contained several changes in the law, which will allow Amtrak to operate more efficiently and profitably.

On the "hardware" side, Amtrak awarded a contract to the Budd Company to build three prototype passenger cars due for service testing shortly. The single level cars will be distinguishable by their double row of windows, permitting upper berth occupants to view the passing countryside.

Two of the prototypes will be fitted out as sleeping cars with total accommodation for 34 passengers, and one will be a dining car seating 48.

When the prototypes have been in service 18 to 24 months for testing, final specifications will be written for production of more.

To an outside observer, Amtrak portrays its image well. Its publicity material is good and clearly written. Its advertising has impact. Its on-train employees, and its ground service staff, generally create a good impression.

It is now possible to make a comparitively easy phone reservation for travel across the continent in a way that was not possible in the days of independent railroads.

All in all, Amtrak is maintaining a tradition of good, comfortable long distance travel in the United States.

And furthermore, it seems to be succeeding in markets where the winning of passengers is important — in the younger generation.

Noticeably, the proportion of young people and families travelling together on long distance trips is high. If these people can be won and retained, then rail passenger service has a future.

In this, Amtrak is aided to an extent by the deregulation of air services in the United States. This has left smaller communities without an adequate and inexpensive air service, and has driven the long distance bus companies to the stage where they can no longer afford to run services to small cities cross-subsidised by their major services.

Their major services are being cut drastically. Amtrak fills the gap, for these communities.

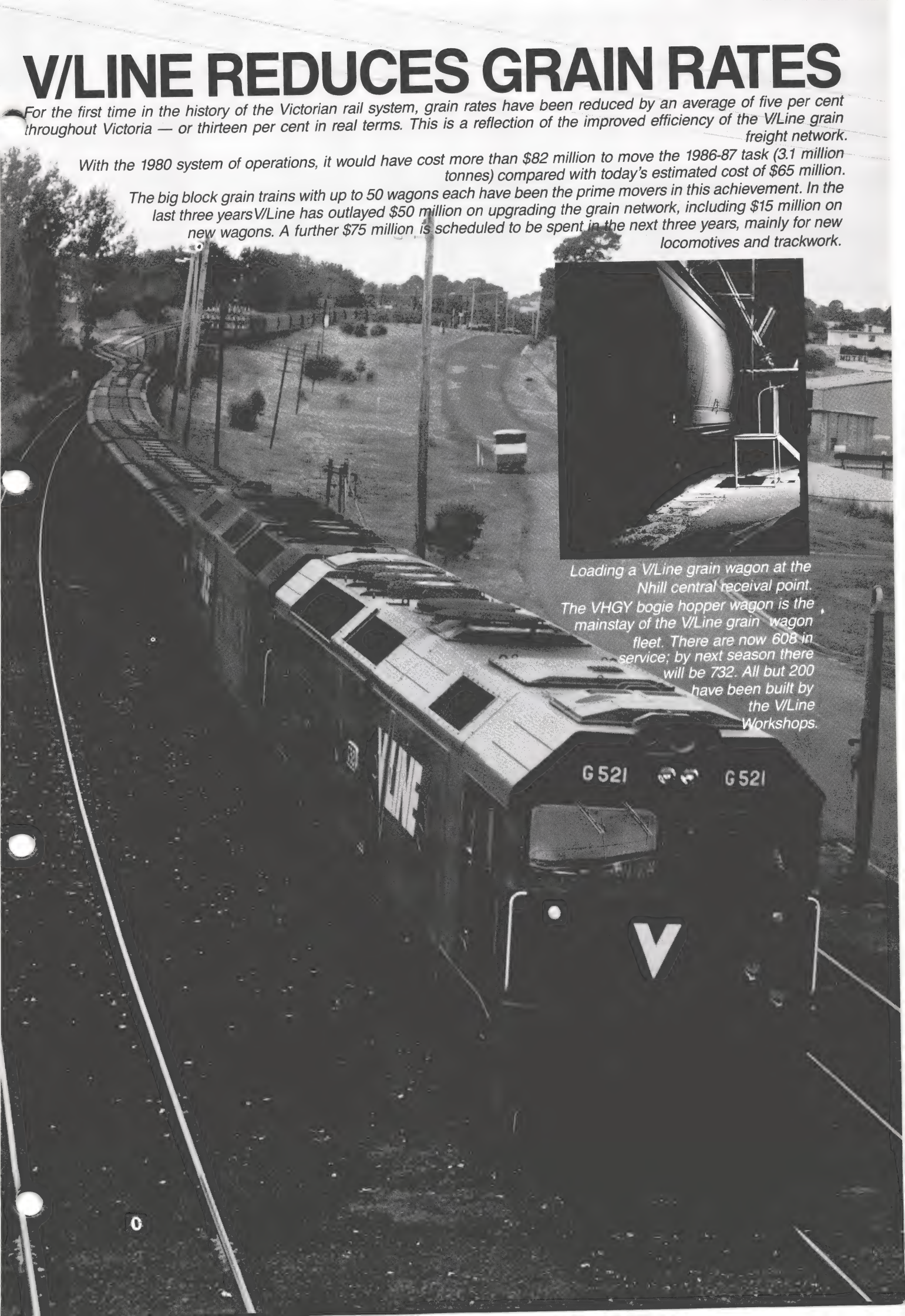
For Australians with an interest in rail travel, and in the history of rail development in the United States, Amtrak provides an excellent way to see a great country and its railroad heritage.

V/LINE REDUCES GRAIN RATES

For the first time in the history of the Victorian rail system, grain rates have been reduced by an average of five per cent throughout Victoria — or thirteen per cent in real terms. This is a reflection of the improved efficiency of the V/Line grain freight network.

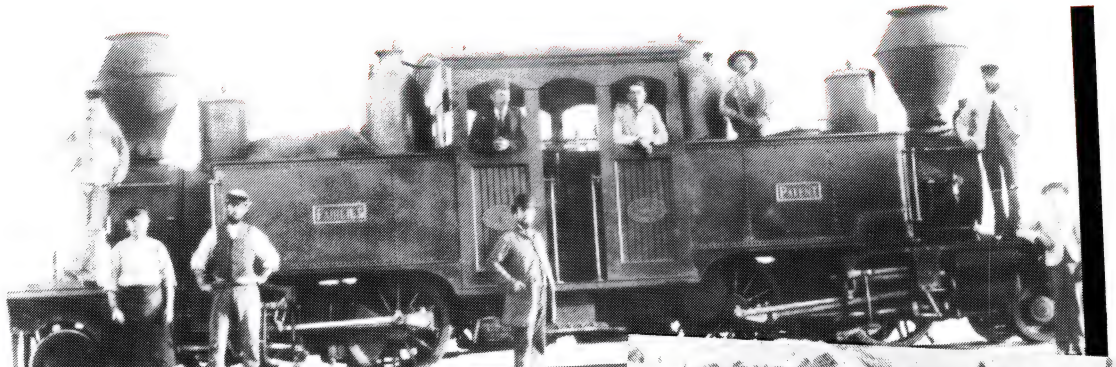
With the 1980 system of operations, it would have cost more than $82 million to move the 1986-87 task (3.1 million tonnes) compared with today's estimated cost of $65 million.

The big block grain trains with up to 50 wagons each have been the prime movers in this achievement. In the last three years V/Line has outlayed $50 million on upgrading the grain network, including $15 million on new wagons. A further $75 million is scheduled to be spent in the next three years, mainly for new locomotives and trackwork.



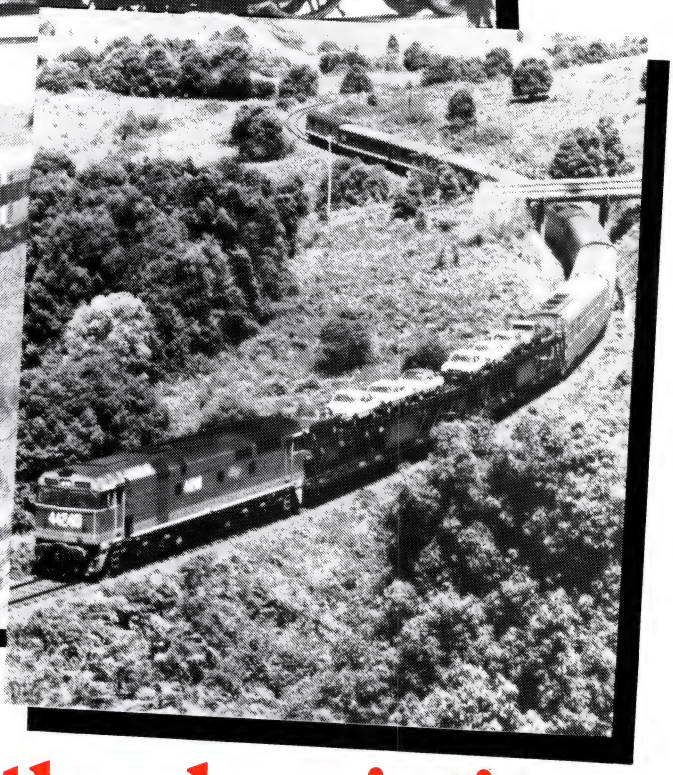
Loading a V/Line grain wagon at the Nhill central receival point. The VHGY bogie hopper wagon is the mainstay of the V/Line grain wagon fleet. There are now 608 in service; by next season there will be 732. All but 200 have been built by the V/Line Workshops.

Want to know more about Australian Railways?



wo "Double Fairlie" locomotives were built in 1879.

Canberra-Sydney XPT in Southern N.S.W.



Gold Coast Motorail, Byron Bay.

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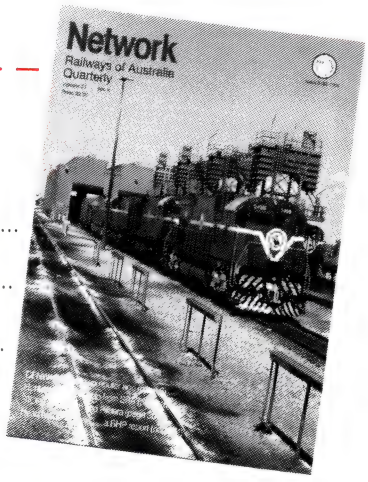


Take the train for America's Cup

An opportunity to see the century's greatest yacht race, combined with the chance to travel on one of the world's top 10 trains is an offer many people will find irresistible.

Add that no overseas travel is involved, and the $A will mean a dollar in value, and it is certain State Rail has a winner with a new series of Great Rail holidays in Perth.

The holidays offer the thrill of seeing the America's Cup after travel on the prestigious Indian Pacific "hotel on wheels."

The three night trip on the train which is named for the two great oceans it connects, provides the comforts of a world class hotel, and panoramas ranging from breathtaking sunrises and dramatic sunsets, to misty valleys, lofty mountain ranges and the awesome expanse of the Nullabor Plain.

Accommodation and meals on the train are deservedly renowned, and the package holidays offer a variety of hotel and lodge accommodation during the stay in Perth.

Travellers can choose to return by air or rail.

Two of the three holiday packages will run from October to February (inclusive), while the third, the "Perth and America's Cup Adventure" will operate between December 1 and February 16.

Duration of the holidays vary from eight days/nine nights (add three days if returning by rail) to 10 days and 10 nights.

Prices range from $1,060 for the shorter holiday to $1,900 for the "Adventure" which includes a number of special tours and cruises, including being aboard the official viewing vessel of the Royal Perth Yacht Club for a privileged view of the races.

There are discounts for pensioners.

'Chock' is an arresting development

Pneumatically powered chock units from Britain can hold a rail tanker in position at a filling point, allowing no movement in either direction along a running track.

They are made by Sodium Warren Engineering of Bristol.

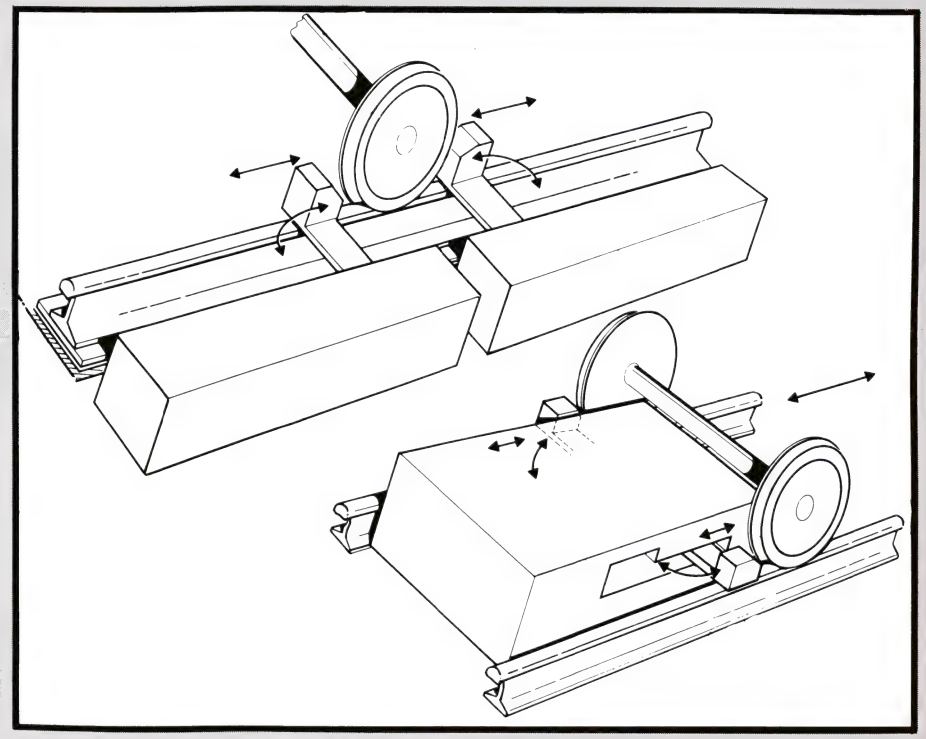
Said to be the only product of its kind on the market, the wagon-locating system permits easy compliance with railway regulations in Britain and elsewhere which require vehicle brakes to be released during loading.

Suitable for use at any rail filling point, but specifically developed to prevent any possibility of spillage when wagons are being filled with dangerous chemicals, chock units are located at a filling point alongside each rail.

Each unit comprises a steel chock on a steel arm, which swings through 90 degrees to bring the chock within close proximity of a wheel flange. Four units are normally required, so that a chock can be positioned on either side of both wheels on a wagon's axle.

Tanker wagons are brought into position under locomotive power, and the brakes applied. The chocks then swing into position, and each holds against an adjustable stop within the mechanism so that the chock is close to the wheel flange, but not actually touching (a wheel cannot therefore become jammed between two chocks).

With the chocks in place, the vehicle brakes can be released, and filling can begin.



Pneumatically-powered chock units from Britain can hold a rail tanker wagon in position at a filling point, allowing no movement and permitting easy compliance with railway regulations in Britain and elsewhere which require vehicle brakes to be released during loading. Two versions are shown: the Gradhold (above) is for use when the track is on a gradient the other is for use on level track.

bookshelf

Janes goes from strength to strength

The fifth edition of this definitive work goes from strength to strength. Each edition has seen an improvement on the last — and the presentation of the current version is a visual delight.

The compilers have obviously gone to great trouble to include in this volume descriptions of the urban transport networks which exist in all parts of the world — with Eastern bloc countries very much in evidence.

The high standard of illustration complements the style of production which we have come to expect from Jane's.

The Australian content remains similar to previous years, with all Australian rail systems noted and represented. Major rail manufacturers are also covered.

In the introduction, the authors have an interesting table of the involvement of private enterprise in the world's public transport systems. Understandably, buses and taxis are the main providers in the private sector — but the commuter railroads of Japan are noted.

Private enterprise bus services serving Brisbane are omitted, but those in Melbourne and Sydney are mentioned.

Our copy came directly from the publishers, and we imagine that the adverse exchange rate will make the volume expensive in Australia. Indeed, it would be available only from specialist booksellers.

"Jane's Urban Transport Systems" edited by Chris Bushell and Peter Stonhan. Published by Jane's Publishing Co. Ltd., 238 City Road, London.

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"A Changing Decade"

By John Dare

The aims and achievements of "A Changing Decade" are aptly summed up in its sub-title — "A Pictorial Book Published to Illustrate the Changing Scenes on the Victorian Railways during the decade 1970 to 1979."

But this book, published by the Australian Railway Historical Society Victorian Division, is no pedestrian record of that decade. It is an extremely perceptive, well produced, visual condensation of the events of 10 important years.

Since 1970, the face of Australia's rail systems has changed markedly — and this change has been very great in the State of Victoria. The form of administration changed, the colour schemes changed, and they have changed again since 1979.

Scenes of the 1970s have disappeared fast — and author John Dare with a team of keen photographers has produced a volume which recalls many aspects of Victorian Railways now gone forever.

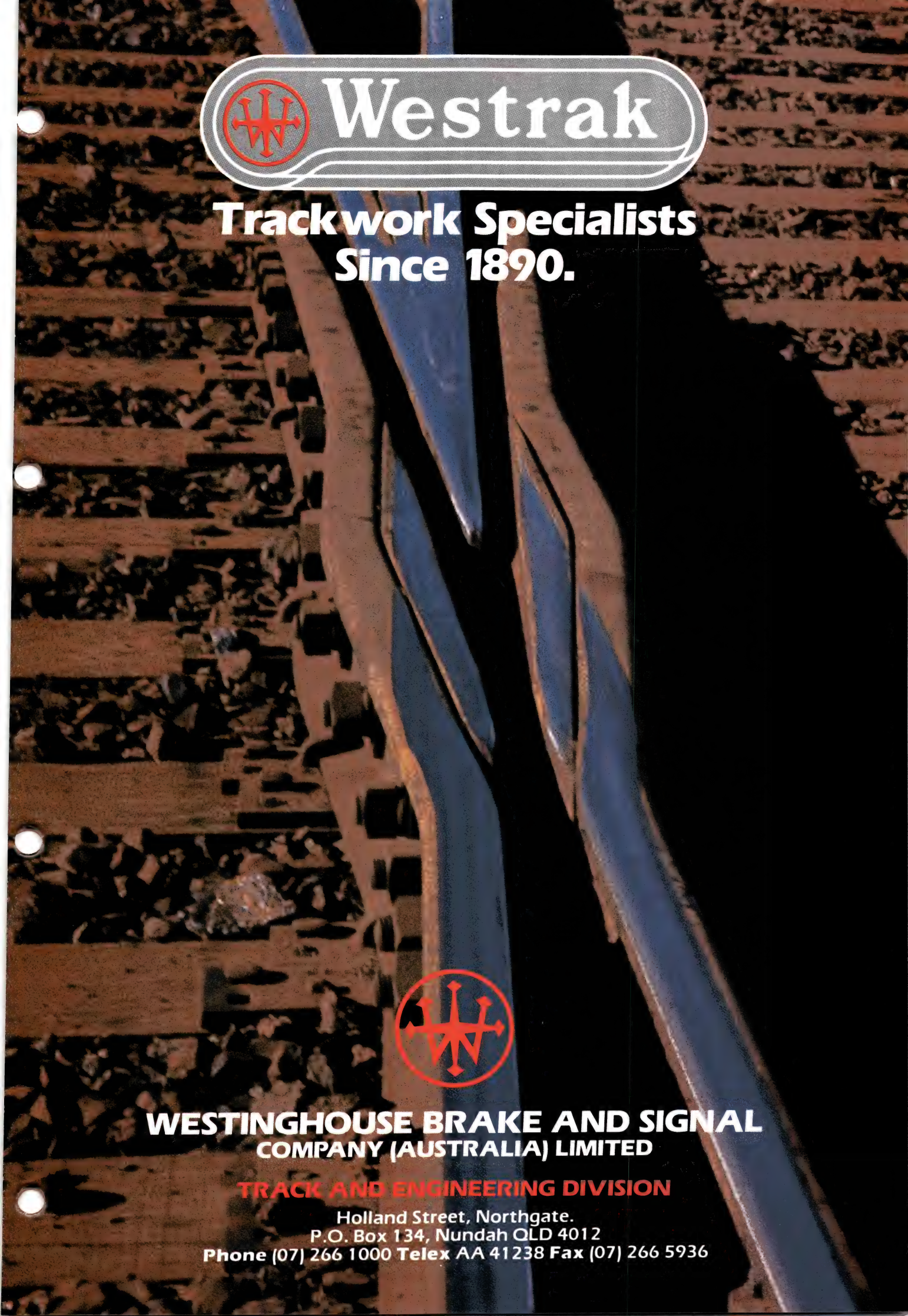
The writing of history in an almost contemporary sense is a difficult task; the author has wisely refrained from too much comment in a book that is essentially pictorial.

A brief chronology of the railway events in Victoria for each of the 10 years prefaces the main body of the book, which is sub-divided with logic and imagination into various areas of the railway scene.

The photographs themselves are excellent, with a sharpness and clarity which other rail publishers would do well to copy. If your reviewer has a point of concern, it is with the colour rendition in some plates.

For those with an interest in the history of Victoria's railways, or those who appreciate rail photography for its own sake, then "A Changing Decade" deserves a place on the bookshelf.

"A Changing Decade," 88pp., 280mm × 216mm. 179 photographs. Available from ARHS Sales Department GPO Box 5177AA Melbourne 3001 at $13.50 including postage. Railway bookshops may also have copies.



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'Experience of a li

"A slow, soothing, timeless world it is, more like an ocean cruise than a train journey."
Michael Frayn, The Ghan, Great Train Journeys of the World. B.B.C. Book and television series, 1981.

At 10.00 a.m. precisely on Thursday, 15th November, 1984 at the Adelaide Rail Passenger Terminal, the long, silver grey train quivered, then pulsed gently into motion. Pulled by two streamlined diesel electric engines, in the green and gold livery of Australian National, we began to glide north. People on the platform stepped back and waved. Then, as we moved on and inner Adelaide unfurled past the windows, railwaymen in the shunting yards, golfers in the Parklands, pensioners in their gardens, children — many paused to look and wave. They had that special expression on their faces, half-wistful, half-excited, which we always assume when we stop whatever we are doing to watch a train go by. Flashing through our humdrum pre-occupations, the big passenger trains evoke travel, mystery, even a dash of adventure. If we can, we take the time to watch them pass.
I settled into my *Twinette* compartment and began to acquaint myself with the facilities: the radio, pop-up tables, wind up blinds and so on. But I kept stopping to gaze as Adelaide slid past the window. I felt that excitement we all feel when starting to travel.
"When do we see a kangaroo?" cried Lilian, a woman from Sussex, down the carpeted corridor.
"This is better than those bloody cars," said Sarah, a pensioner in the lounge as she sipped her brandy and water and contemplated the scenery.
We were beginning one of the world's great train journeys. We were pounding along a track, that twenty-four hours and 1555 kilometres later, ends in the Red Centre of Australia — Alice Springs.

We were on the Ghan

Why the odd, appealing name? Australian English is good on pithy evocative names like *the Top End, Down Under, no hoper, walkabout, the Outback and so on.* The *Ghan* is in the front rank of these, of special meaning to Australians. It derives from Afghan. From the 1860s to 1920s several hundred Afghan and Indian camel drivers or cameleers ranged the Australian interior with their teams of tall, swaying, gracefully awkward, single-humped camels, each beast connected to the other by a lead rope. Most of the cameleers came from the area now known as Pakistan, and especially from Karachi, rather than Afghanistan. But the Australians called them Ghans. Camels, and their drivers, were first brought into Australia in 1860 for the ill-fated Burke and Wills expedition across the continent to the Gulf of Carpentaria.
Later the same year, Sir Thomas Elder, a merchant and pastoralist whose land holdings in South Australia were bigger in area than his native Scotland, imported more Afghans and their camels, which he began to breed — the camels of course — at his Beltana property. Camels with their endurance and capacity to cross country too tough for horses and bullock teams, soon became a vital element in outback transportation. Many more were imported on the return journey of the ships that used to take horses, or re-mounts, from South Australian breeding stations to India for use by the Indian Army. Each camel could carry a cleverly-arranged load of up to eight hundredweight (400 kilos) for at least twenty miles a day. The camel teams would set off in the very early morning, rest up during the heat of the day, then continue to plod across sun-blasted landscapes of saltbush, mulga, gibber plains and desert every bit as hostile as those of their native India or Arabia. Many explorers, right up to C.T. Madigan's crossing of the notorious Simpson Desert in 1939, relied on camels during their revelations of Central

This interesting exerpt from 'Gone on the Ghan' by Adelaide author and identity, Derek Whitelock should appeal to many readers. Mr. Whitelock was inspired to write this book about his travels on Australian railways through contact with Australian National General Manager, Dr. Don Williams. "Gone on the Ghan and other Great Railway Journeys of Australia" now retails for $24.95, at leading book stores.

'THE LONG SILVER-GREY TRAIN QUIVER

etime' says author

Australia. Police and missionaries used them.

The cameleers were Muslims, and many of the Ghan Camps on the outskirts of remote towns like Marree has a mosque. For decades men in turbans and dhotis with their camel strings formed oriental silhouettes on the dunes of the Red Centre as they carried supplies and goods along a vast network of trails between Bourke in New South Wales, Cloncurry in Queensland, Marble Bar in Western Australia, Darwin in the Northern Territory and Oodnadatta in South Australia.

As foreign, efficient and teetotal competitors who drove hard bargains, the Afghans were bitterly resented by white bullock teamsters, but they were indispensible during the pioneering and early development of the Centre. Camel teams carried the pole and supplies for the men building the Overland Telegraph between 1870 and 1872 which provided an overhead electric cable between Adelaide and Darwin and linked Australia by cable with Britain. It spanned 1800 miles (3000 km) of mainly uninhabited, rugged and uncompromisingly hot terrain. Alice Springs originated as a central signalling station on the Overland Telegraph.

Similarly, when the railway began to thrust north from Adelaide and Port Augusta to service the mines of the Flinders Ranges and pastoralists between Spencer Gulf and Alice Springs, the camel trains gave vital help to a system that was eventually to help make them redundant.

Camels literally humped sleepers, rail and necessities to the navvies as they pushed on the line, at an average of two miles a day (3.2 kilometres) from Marree across the arid plains west of Lake Eyre to Oodnadatta. Then during the *Long Pause* of forty years until 1929, when the rail link between Oodnadatta to Alice Springs was completed, the camel trains transported goods and people across the hundreds of kilometres of saltbush between the railhead and *The Alice.*

In time, of course, trains and trucks replaced the cameleers. The camels were freed to roam the Centre, the only wild camels in the world. The environment suits them so well that fine camels are now exported from Australia to some Arab countries. Some are used today on tourist safaris. Descendants of the cameleers still live in Alice Springs and Marree.

A good feature film could be made of the camel train saga. Thus it is entirely right that one of Australia's two best-known modern trains — the other is the *Indian Pacific* — should be called the *Ghan.* (During the excellent BBC television series *Great Train Journeys of the World,* the British author Michael Frayn travelled the *Indian Pacific* and the *Ghan,* and aroused the interest of untold numbers of viewers in these unique forays across the Outback).

The Old Ghan

As to when and how the train was first called the Ghan, Basil Fuller in his absorbing book *The Ghan: The story of the Alice Springs Railway* (Rigby, Adelaide, 1975) says that so many cameleers used to travel between Marree and the railhead that the navvies called the train the *Afghan Express.* Inevitably, this being Australia, it became just the *Ghan.* For awhile, the goods train up to Alice Springs was nicknamed the *Utility Ghan* and the passenger train *the Flash Ghan.*

For about fifty years the old passenger *Ghan* that ran fortnightly, then weekly, between Port Augusta and Alice Springs via Quorn, Marree and Oodnadatta was part of the Australian legend. Until the standard gauge connection was completed, pasengers had to change trains at Marree.

Winding through the spectacular valleys of the Flinders Ranges through cuttings dug out mainly by the muscle power of the navvies with their banjos — railway workers' shovels; then snaking across the mulga-studded plains, the old track traversed over a thousand kilometres of wilderness. Nor surprisingly, it was often disrupted.

Engineering breakdowns were to be expected, but the *Ghan* also had to contend with the unpredictable power of the Outback. This ranged from termites eating the sleepers, sand, drift, rockfalls, stock and kangaroos on the track, to heat buckled rails and massive flooding.

The occasional summer cloudburst in the Centre quickly transforms normally dry river beds like the Todd and especially the Finke into prodigious torrents that can rip out big redgums, flatten houses and drown cattle.

Mind you, the old steam engines were better than diesels in flood, and could wade through three or four feet of water. Thus the old Ghan was sometimes marooned for days at a time.

A conductor who use to work on it told me:

"When I said I'd be back on Friday, my wife would say: Which Friday?"

A Territorian in the Todd Tavern in Alice Springs talked about the old Ghan — "It was our lifeline, mate." His Chinese grandfather had worked for 47 years as a railway fettler and had photographs showing the *Ghan* rails, after a bad flood, *"twisted like barbed wire."*

(continued on page 28)

ED THEN PULSED GENTLY INTO MOTION'

(continued from page 28)

Michael Frayn mused on his journey — one of the last — on the old, run-down narrow-gauge Ghan:
"On the rails go... on into the heart of Australia, staggering and weaving like two exhausted explorers, due north into the eye of the noonday sun. Over cracked earth and drunken bridges with nothing but rotting sleepers between us and the dry creekbed, sixty feet below."
Frayn — I know him well — is a thorough Londoner with no eye for the majesty of the Outback. However, he did repeat one of the best of the old *Ghan* legends:
There is a story about a woman on the Ghan who keeps asking the conductor what time they get to Alice Springs. Everytime the train stops she asks him. The conductor gets a little impatient. 'What's the hurry?' he says. 'We'll get there some time in the next few days.' So the woman says, 'Listen.

(continued on page 30)

Left: Comfortable twin bed accommodation in a Ghan "twinette" is like hotel accommodation on wheels. Below: The dining car offers an excellent a la carte menu with a selection of fine Australian wines.

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I'm due to have a baby.' 'Well,' says the conductor, 'You shouldn't have got on the train in this condition.' And the woman says: 'When I got on the train, I wasn't in this condition!' "

Of course, I was travelling on the new *Ghan*, on the new all-weather track that strikes north from the transcontinental line at Tarcoola, a hundred kilometres or so west of the original, trouble-prone track through the Flinders. This route was opened in 1980 by Princess Alexandra, and commemorated by a striking bronze of a camel with an Afghan perched on its rump in Alice Springs station. There is a replica in the AN headquarters in Adelaide.

I found that some of my fellow passengers on this train and others all over Australia had affectionate memories of the old *Ghan*. It was expected to be late. It took nearly three days to get to Alice Springs, if you were lucky.

"It was a drinking man's train," one veteran recalled fondly. "The bar was open all the time. If we got stuck we had a party."

"Everything was easy going. Now that she's gone, we miss her," said a diesel electric driver on the new route.

One had ample time to enjoy the scenery of the Flinders. I was told more than once that as the *Ghan* toiled slowly up gradients, the passengers would get out and walk along beside it for exercise.

Steam-hauled for most of its existence, the *Ghan* signified its presence with a plume of smoke drifting across a colossal landscape: a welcome sight to isolated people in one of the loneliest parts of Australia. To travel on it was a social occasion, as was its arrival and departure at little Outback stations.

The Wanderer Wilfred Thomas wrote in his *Living On Air* (1946) of a trip on the *Ghan* in the 1930s, when prospectors, station hands, swagmen and miners were its main users:

"From Quorn I caught the Ghan to Alice Springs, the oasis town in the centre of the continent... The moment you stepped aboard.. you entered a new world, where inhibitions dropped to zero and mateship soared. It became the only world for you where you were safe from the arid wastes and burning ridges outside. My carriage was one of those long ones with seats down the side. At least there were seats until some of my fellow-passengers tore them up to make room to dance in, to the music of the bagpipes which one of them played."

Bluey, a cattleman *"tall as Chips Rafferty,"* looked after Thomas during the revels that followed. As there were no women in the carriages, the miners and stockmen danced with each other, *"jigging and yelping and hoo-roo-ing up and down the aisle as the train bounded and rattled and bored its way through the empty night, and the bagpipes wailed and shrieked."*

They slept rolled up in their blankets. At a stop, the engineer invited Thomas to drive the engine, which he did for an hour.

"I got up there amongst the roaring steam, the fire-eating furnace, the rattle and roll. No houses or tall trees, a world of sparse mulga scrub; once a dead horse by the line, a couple of emus racing away from us, a tall, brown kangaroo bounding alongside, a lonely prospector's grave. All the way empty beer bottles sparkled in the sun, cast there by passing travellers."

So the old rip roaring *Ghan* had character. It puffs and whistles its way across Australian folk memory, from the times when it was par for the course, in Sydney or Melbourne or Adelaide, to hear on the news that the *Ghan* was stranded somewhere half a continent away, between the salt lakes and the deserts.

Things have changed. Tourists and senior citizens' club outings are more notable than stockmen on the new *Ghan*. It is faster, more comfortable, travels a much less accident-prone route and is as on time as any other train — which is a remarkable feat considering the distance and type of country covered.

But the modern *Ghan* has inherited more than the exotic name. It still reveals incomparably the majestic red heartland of Australia. Mateship still soars; inhibitions ease, friendships are made; colourful characters have the

Below: The lounge provides an excellent social hub on The Ghan

'THE GHAN STILL REVEALS THE MAJE

time and stimulus to emerge; people relax and enjoy themselves and share a distinctive adventure in travel on the *Ghan*.

As I found out on this trip.

The Journey and the People

By the time I had familiarised myself with the facilities of my *Twinette* — two pull down beds, a private shower and toilet, a big picture window, and impressive concentration of comfort and convenience in a small area — Adelaide, sunning herself amid her green and gracious Parklands between the hills and the sea, was far behind us. The *Ghan* had settled into a quiet, pulsing gallop along the track.

There was none of the smoke, creaks and clattering of the grand old steam trains that used to crash across the landscape like Chinese dragons. Ultra modern, honed down by its designers to the aerodynamic ultimate, the *Ghan* hurtles along with the minimum of noise and fuss. You feel as if you have been launched into space, watching

South Australia pass by on a big television screen.

I wandered along to the lounge car with its piano, bar and armchairs and chatted to Sarah as she sipped appreciatively at her brandy. Like so many retired people, she was an enthusiastic traveller, not at all fazed about roaming the rails on her own.

She was about seventy, with *"bad legs,"* but full of go. I noticed that night that she was the most energetic songstress by the piano. Sarah would join a tour party at Alice Springs to visit Ayers Rock, Standley Chasm, the Olgas. *"I've always wanted to see the Rock."*

She enthused about the retirement village where she lives. *"Get your name down for a place,"* she urged.

"They're going to be hard to get." The people there were friendly, but since most of the men seem to die long before their wives, some widows *"get a bit nasty. Its such a shame. The men work hard all their lives, then when they retire they pop off."*

However, the next person I talked to on the Ghan was an eighty-eight year old widower a long way from popping off.

This was Bob, a Victorian, who had come overnight on the *Overland* from Melbourne to join the train. He too was travelling on his own and would join a coach party at Alice Springs. Lean, a good head of hair, no spectacles, his own teeth, spry and twinkling, Bob relaxed with his beer and looked at the wheat country between Mallala and Snowtown. Originally, this area had been covered by mallee, an Aboriginal name for a tough, dwarf eucalypt that thrives on dry, stony soil.

There were dense surviving mallee clumps between the paddocks of wheat and barley. Clearing mallee in the old days was back-breaking work.

We passed several isolated cottages, crouched under peppertrees, roofs gone, windows blank, redolent of much toil and heartbreak.

The sight stirred memories in Bob. He had spent his youth on a small wheat farm in the Victorian mallee, near Swan Hill on the Murray. Over a delicious chicken salad lunch in the dining car he reminisced about the realities of bush life in the good old days.

"It was all hard work." He gestured at the mallee through the window. *"I've seen it so thick you couldn't push your arm through the bastard."* They thinned the hard, spindly stems with axes; then crushed them with heavy rollers pulled by bullock teams or Clydesdale horses. They burned the branches, then gouged out the stumps with crowbars. The big stumps were dragged out by horses straining on chains. Bullocks had their advantages, being less trouble to feed and maintain than horses. They were strong and intelligent. The bullock drivers controlled them with whip cracking and words of their own.

"There must have been a lot of injuries," I said. *"If you were sick,"* said Bob, *"you had to ride into the nearest town. Whatever was wrong with you, the doctor gave you the same thing — fever cure pills."*

He spoke of the hard, lonely lives of the women in the mallee farms and of losing battles with drought during which men went broke and abandoned their properties. Few mallee farmers became rich.

"We used to say, if you get three good seasons then walk off the place. Don't chance you arm."

All this hardship seemed a far cry from the comforts of the Ghan, as we sipped our moselle and sped over the tamed mallee.

As if mallee farming were not hard enough, Bob had then volunteered to fight with the Anzacs at Gallipoli and in Flanders, where many thousands of Australian soldiers were killed or maimed in unspeakable condition.

The Great War cost Australia nearly a quarter of a million casualties. At Pozieres he was shot through the chest. *"Then when I fell back into the trench I broke my flaming neck."* Being invalided out of that Golgotha almost certainly saved his life.

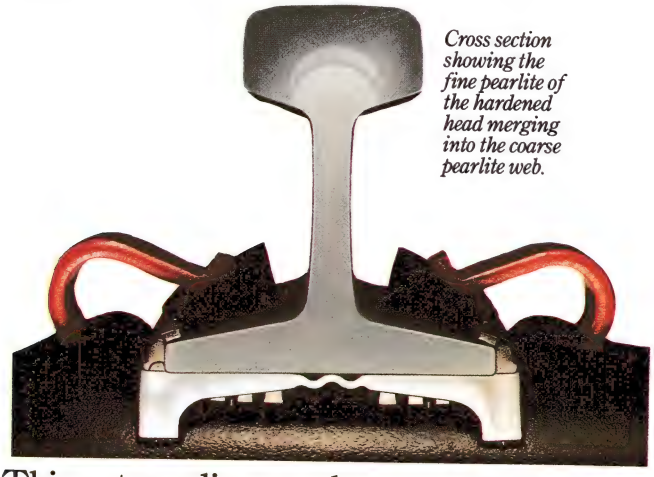
Now, seventy years on, Bob was enjoying the *Ghan* at least as much as any of the other hundred or so passengers.

STIC RED HEARTLAND OF AUSTRALIA'

Given time, everyone will

BHP Steel have developed head hardened rails which can last up to twice the lifetime of conventional rails.

Already in use at the Mount Newman Mine in West Australia, this track carries 50 million tonnes of ore per annum.



Cross section showing the fine pearlite of the hardened head merging into the coarse pearlite web.

This extraordinary volume coupled with the isolated position of the mine, made it essential to have a track that would be durable.

Urban transportation will also benefit from the use of head hardened rails.

Where high wear areas of suburban rail track exist, particularly curves and platforms, significant savings can be realised.

Head hardened rails are produced to a restricted chemistry specification which is within the required standards of AREA or AS 1085. The head of the rail is heat treated by a two stage induction heating process, followed by a slack quench. In this process, the rail head passes through one set of inductors that preheat the head to approximately 500-600°C. Then, a second set of inductors raise the temperature above the autenising temperature (900°C+). The rail head is then subjected to a controlled quenching operation that results in the formation of a fine pearlitic micro-structure.

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Head hardened

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M.R.L. have contributed to making major advances in rail and wheel performance, sleepers and their fastening

	UNLUBRICATED	LUBRICATED	AVERAGE
	1.00	2.10	1.55
	1.74	3.32	2.53
	2.10	3.61	2.86
	2.73	4.33	3.53

(These results are an index)

and insulation systems, wheel/rail interactions, vehicle dynamics, track design, track and vehicle maintenance economics and rail, track and wheel maintenance management.

BALL/BHL 1170

To assist in decision making, the services of the laboratories are available for problem solving and procedure analysis.

From its very beginning, BHP has been closely involved in the development of Australia's railways.

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Long Products Division

BR BOOSTS SPENDING TO CUT COSTS

Railways in Britain today are undergoing a renaissance. Just three years ago there was only one minor electrification scheme in progress and a government-sponsored report considered the consequences of cutting the system to less than a quarter its present size.

Now, however, there are nine electrification schemes in progress (including an important 650 km London-Edinburgh line), only a handful of lines are proposed for closure, and the state-owned railway system, British Rail (BR), plans to invest more than 400 million a year over the next five years.

The key to BR's success has been the way in which it has managed to convince the government that it means business.

BR has agreed to a cut in its subsidy from the government for socially-necessary but unprofitable lines by one third to 630 million a year and some parts of the railway, such as freight services, are to be run as profit-making concerns in the manner of the private sector.

To achieve the necessary tight control on finances, BR has organised itself into five separate businesses: three passenger businesses responsible for the InterCity services, London commuter services (some extending up to 160 km), and provincial services (urban and rural) respectively; and the freight and parcels sectors.

These businesses have taken over control of policy from the old geographical regional management structures with remarkable results.

Cross-London Link

In London, for instance, there is a tunnel running under Snow Hill in the centre of the city linking the networks north and south of the River Thames. This was last used for freight trains 20 years ago and, incredible though it may seem, has not been used by passenger trains for 60 years even though it provides a direct link between the main line systems north and south of the capital.

The previous regional managements, based on the old private railway companies that existed prior to nationalisation in 1948, were concerned only with running their own patches of railway and were not keen on linking up with other parts of the national system.

The new London commuter business, responsible for lines all round the capital, has won government authority to invest in a fleet of new trains for the Snow Hill tunnel.

This will give not only increased revenue, making journeys such as the 90 km from Luton Airport to the north of London to Gatwick Airport to the south possible by direct train, but will cut costs since trains will not waste time turning round at terminal stations in London.

All the five new businesses are seeking to cut costs and improve revenue with investment in new equipment.

The InterCity business has managed to justify financially the electrification of the London to Edinburgh line by the cost savings that electric haulage will give over diesel trains.

The InterCity 125 trains which work that route are, incidentally, the fastest diesel-worked trains in the world, running at speeds up to 200 km/h.

Modular Catering

InterCity is ordering a large new fleet of electric locomotives and coaches to work the newly-electrified route and also to replace life-expired trains on the 300 km London to Manchester and 630 km London to Glasgow routes, which are already electrified.

The new trains will not be BRs famous tilting Advanced Passenger Trains, (APT) which ran into technical problems, although BR has not given up on the idea of using a tilting train in order to allow curves to be taken faster.

The new trains for the curvy London to Glasgow route may well have a tilting system but on the London to Edinburgh route, which is mostly straight, the trains will not tilt but will nevertheless be able to travel at speeds up to 225 km/h.

BR is also investing in a new catering system for its InterCity trains.

Following successful trials with a prototype, 61 catering vehicles operating on the lines out of London's Euston station are being turned over to the new modular system of catering.

The modular system follows the trend of other European railways in having as much off-train preparation of food as possible, leaving the staff on the train free to concentrate on service to the customer.

The prepared food is taken onto the train in wheeled containers — the modules — ready for re-heating before serving.

Travellers on BR's local routes have not been left out in the big re-equipment programme that is now taking place.

These lines have been soldiering on with trains built 25 years ago and some passengers were afraid that when these were scrapped the lines would be closed.

Closing lines is a very unpopular and difficult procedure, since long public hearings have to be held before any can be sanctioned for closure.

Reduced Maintenance Requirement

BR managed to convince the government that if the lines were to be kept open it would be much cheaper to run them with new trains with lower operating and maintenance costs.

Two new designs of diesel train have been adopted, one based on bus construction for shorter trips and the other a more conventional railway vehicle for longer distance work.

The bus-based train gives a 20% saving in fuel cost compared to the trains it is replacing.

Both new types of train have lower maintenance requirements than the old ones which will allow BR to make savings by reducing the number of maintenance depots.

The longer-distance trains are able to run for 1600 km between refuelling (three days' work) and, while oil checks need to be made every ten days or so, the new units only have to return to their home depots for major examination every ten weeks.

Less time in the maintenance depot means more time to work.

The general rule of thumb that BR is using in its replacement programme is that every three new vehicles are sufficient to replace four old ones.

New trains are not the only way in which the costs of operating rural lines are being lowered.

An important new development combining the use of micro-electronics and radio has been pioneered in Britain.

Under the old system of signalling that is being replaced, two trains were prevented from being on the same piece of single track together by the use of a single physical token.

When holding this, the train driver had authority to proceed onto a single track, and exchanged it at the next signal box at a passing loop for another token covering the next stretch of single line.

Although very safe, this system had the drawback that signalmen were needed at the remote rural passing loops.

The bus-based trains give a 20% saving in fuel cost compared to the trains they will replace.

Realising the Assets

The new system works on the same basic principle, but the token takes the form of a radio signal beamed to the locomotive. The micro-electronics ensure that no more than one locomotive will be given authority by the radio to proceed on a stretch of single line.

Radio signalling has proved very successful at cutting costs and is being introduced on lines in the highlands of Scotland and Wales and also in the flatlands of East Anglia.

Where is the money coming from for BR's investment programme?

A major source of income is the British Rail Property Board (BRPB), which manages BR's property interests. Old marshalling yards no longer required have been sold off for housing and industrial development while in London and other big cities, offices are being developed above large redeveloped railway stations.

From January 1984 to March 1985, BRPB made a £200 million cash contribution to BR.

The ordinary rail traveller is able to identify a major source of BR's income: British fares are some of the highest in Europe.

In contrast to many other railways, BR does not have a per kilometre pricing rate for the whole system but charges what the market will bear on each route.

Thus the per kilometre price on the London to Newcastle, northeast England, route, for instance, is much higher than on the London to Plymouth, southwest England, route.

On the Newcastle route BR is in a very strong position and is preferred by most travellers to rival air and coach services while to Plymouth the trains are challenged strongly by fast and comfortable road coaches. BR has developed a range of cheap fares known as Savers which are available at off-peak times when there are spare seats available.

Another way in which BR's corporate balance sheet is being helped is by economising on staff numbers.

In the five years to March 1985, the number of BR employees was reduced by 17% and in the European railways (excluding Scandinavia) staff productivity league, Britain holds joint second place with Switzerland, beaten only by the Netherlands but well ahead of the other nations.

Meeting Competition

BR staff numbers have been cut by going from three tiers of management to two and also by cutting other staff.

Some freight and suburban passenger trains are now operated by the driver alone.

(continued on page 52)

FACT:

1,000 metres of track per hour – tamped, levelled and lined...

by the revolutionary 09-16CAT Continuous Action Tamping Machine

December 1985 saw Westrail take delivery of the first continuous tamping machine in Australia. This machine has produced documented performances in excess of 1000 metres per hour, averaged over a full 8 hour track possession period.

Conventional tamping machines must stop and start at every sleeper and therefore are limited in their maximum production rate. They also impose heavy stresses on both crew and components when operating at or near their maximum potential.

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A SOUTH AUSTRALIAN JUBILEE

VICTOR HARBOR HORS

It's a "far cry" from the superb technology of the S.T.A. of SA's new Busway, but many people will no doubt applaud the imminent return of a far older form of "guided track" passenger transport. The Victor Harbor Tram service to Granite Island will reopen shortly as part of South Australia's 150th Birthday celebrations.

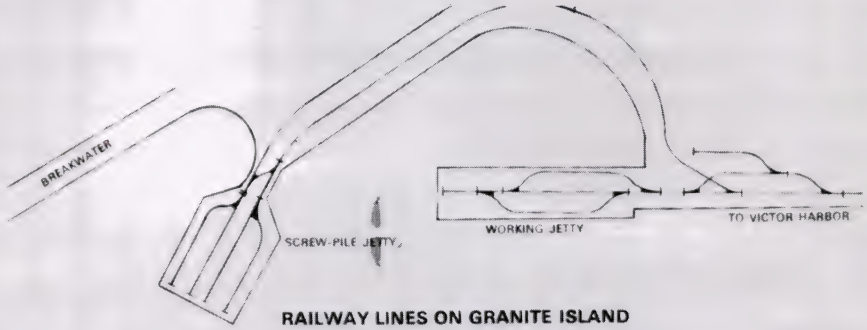
The proposal to restore the service was made in 1983, and presented to the Recreation and Festivals Committee of the Jubilee 150 organisation, as an excellent way to mark the event.

In the first instance, finding an organizer to take on the construction and operation of the proposed service was extremely difficult. After spending time searching for somebody to initiate the project, the District Council of Victor Harbor agreed to support a study of the tramway's potential for commercial operation. Subsequently, the Council decided to proceed with the construction of trams and laying of track and to take sole responsibility for the system.

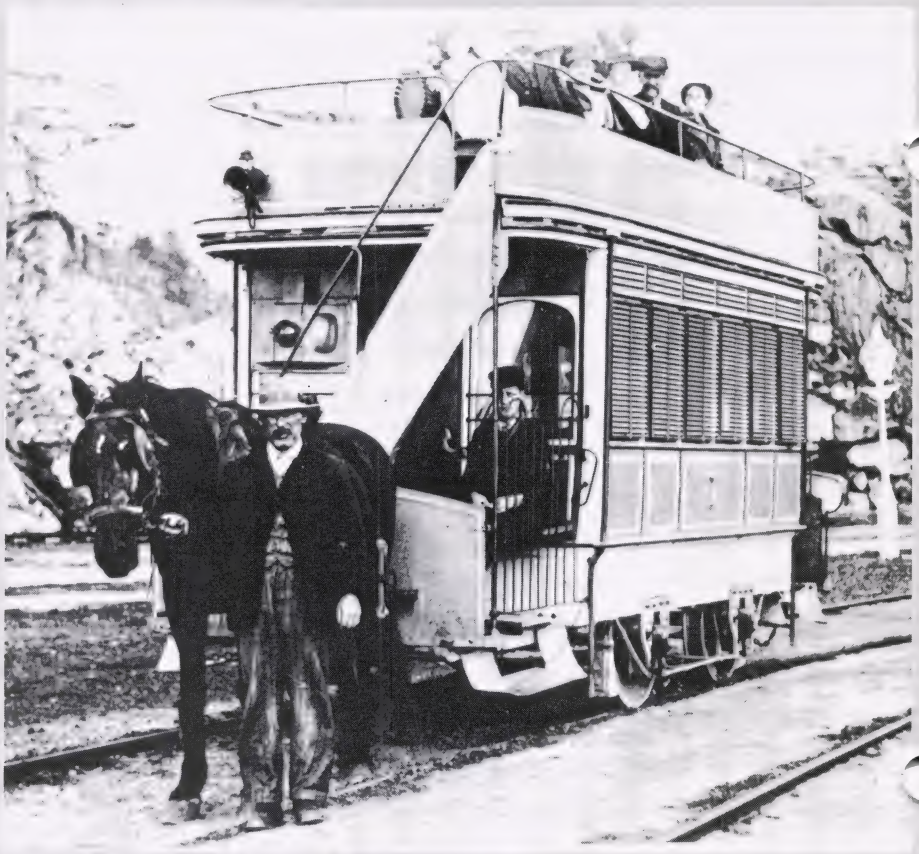
A grant of $50,000 was allocated by the Jubilee 150 Board to begin the project and considerable effort was put into a C.E.P. proposal to use unemployed persons to construct the trams and lay the tracks. A C.E.P. grant of more than $200,000 was obtained for this purpose.

The Department of Marine and Harbours concurrently surveyed the conditions of the timber Causeway between the foreshore and Granite Island and spent more than $170,000 in upgrading it to an axle load of at least 9 tonnes.

The Victor Harbor Council itself allocated a considerable amount of money, to bring the total cost of the project to more than $500,000.



RAILWAY LINES ON GRANITE ISLAND



Clydesdale horses are used to pull the trams

Australian National agreed to provide a Ganger from its Murray Bridge Division to supervise the unskilled labour employed for laying of the track on the Causeway and on Granite Island.

Track laying took about six weeks. AN supplied recovered rail from its closed Port Wakefield to Bowmans line, north of Adelaide. They also supplied narrow gauge 4 wheel freight wagon axle sets and brake gear from condemned stock at Peterborough. They have been regauged to 5'3" broad gauge (1600 mm) . The State Transport Authority of South Australia provided drawings and other details from 1880 contracts for horse trams. A Glenelg tram undergoing refurbishing in the STA's City Depot was used as a pattern for numerous fittings, window operation and interior timber finishing.

ɔU CELEBRATION EVENT

At a later stage the trams will run to Chiton Rock

By John Drennan

Both rail organisations gave considerable informal advice to the Victor Harbor Council during design and construction.
The Metal Industries Association also co-operated by allowing the construction of trams to take place in the workshop used for the Jubilee Ship 'Falie'. The facilities were found to be ideal for the purpose. Fortunately, the 'Falie' was finished just as the Horse Tram project was programmed to begin.
The Victor Harbor Council, as owner/operator, appointed a full time technical officer to oversee the project and when the work is completed he will be employed on normal Council activities.
Clydesdale horses are used to pull the trams and four horses have been hired from Doug Bunker of Hahndorf. He will be employed full time by the Council to drive and look after the Clydesdales at Victor Harbor.
The initial operation started on 14th June 1986, with two horse trams and subsequently a further two trams will be introduced to service the expected demand. In peak summer operations it will be possible for two trams to cross on Granite Island where provision has been made in the track for a passing loop.
At a later stage, it is envisaged that the horse trams will run to Hindmarsh River and then on to Chiton Rocks. A third stage under consideration involves the construction of a tractor-mounted engine on a bogie which will

have sufficient power to pull two fully laden horse trams to Port Elliott and, possibly to Goolwa. The tractor unit will be "dressed" to resemble the Steam Tram "Eureka" which ran on the Port Adelaide and Glenelg railways before 1900.
The "Eureka" ersatz replica will be useful in hauling trams during shunting and at times when weather conditions are unfavourable for horses.
Trams will be of modern, steel-welded construction, with roller bearings in the wheels to make them easier for the horses to pull and will be clad with plywood and timber battens.
Bells from old steam engines will be fitted for signalling by conductors and as a warning by the driver to pedestrians. Some of these bells are over 100 years old.
Design drawings of the original vehicles have been found in South Australian Railways and M.T.T. records, which are being used to re-create, as far as possible, the appearance of Victorian-era trams. The trams have been designed to seat 50 passengers.
As in the early days of operation, there was no roof-covering upstairs because of the high winds which often blow over the Causeway. A traditional canvas roof would act as a sail, which could possibly help to capsize the vehicle.
The trams will be stored in the Victor Harbor Railway Station goods shed and serviced and maintained on the site. Whenever major work needs to be done, the trams can easily be loaded onto four-wheel road trailers and towed by truck to the Council workshops near the Inman River.
Timetables have been prepared for a number of operating options and it is likely that in the peak of summer, a 12-minute service will operate over the Causeway. It is proposed, at this stage, that passengers will board the trams at the Victor Harbor Station goods shed and travel to the kiosk on Granite Island, a distance of approximately 1.8 kilometres. The journey is estimated to take 12 minutes. Horses will cross at a point near the junction of the Causeway and the Island, about 700 metres from the kiosk.
The Council has agreed to operate the trams every day of the year in order to make them a viable tourist attraction for coach operators and the Department of Tourism in Adelaide.
Apart from a tourist tramway on the Isle of Man, it is believed that the Victor Harbor Horse Tram service will be the only horse-drawn daily public transport service operating anywhere in the world.
Australias first railway (1854) will see history repeat itself as the horse trams return.

In summer a 12 minute service will operate over the Causeway

E TRAM RIDES AGAIN

AUSTRALIAN NATIONAL. THE PRIME MOVER

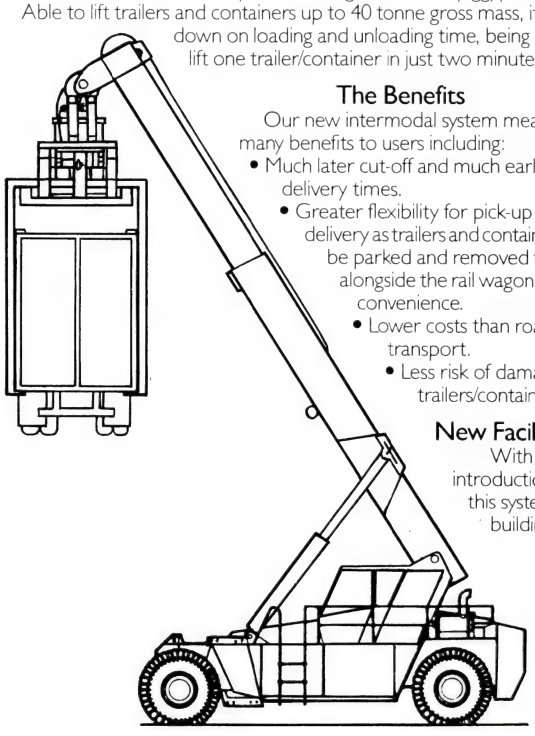
Australian National, the nation's primemover of general freight between the Eastern States and Western Australia and the Northern Territory is set to consolidate its position by introducing an innovative intermodal system firstly between Adelaide and Alice Springs and then between Adelaide and Western Australia.

Intermodal Innovation

The new intermodal system is designed to attract more road trailers to use our "piggyback" service, and to facilitate the handling of container traffic. The system embodies the use of wagons fitted with hitches for quick and easy securing of trailer king-pins, with the semi-trailers being lifted onto and off wagons instead of being driven on and off loading ramps.

The Piggypacker

The star of our new prime moving show is the piggypacker. Able to lift trailers and containers up to 40 tonne gross mass, it cuts down on loading and unloading time, being able to lift one trailer/container in just two minutes.



The Benefits

Our new intermodal system means many benefits to users including:

- Much later cut-off and much earlier delivery times.
- Greater flexibility for pick-up and delivery as trailers and containers can be parked and removed from alongside the rail wagon at your convenience.
- Lower costs than road transport.
- Less risk of damage to trailers/containers.

New Facilities

With the introduction of this system, the building of

new intermodal yards is in progress at Islington and Alice Springs. Our new designs facilitate unrestricted pick-up and placement of trailers by allowing for loading to take place on one side of the track and unloading on the other side.

Contact Australian National Now

With our innovative intermodal system, you'll be wanting to save time and money from now on. Call us now, we'll be only too happy to discuss your intermodal linehaul requirements with you.

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Embank Arcade, 325 Collins Street, Melbourne Vic. 3000
Ring Esmond Fernand on (03) 62 5181/62 4399

Sydney
Suite 3, Third Floor, Citicorp House, 30 Darcy Street,
Parramatta NSW 2150
Ring John West or Barry Kite on (02) 689 3655

Perth
Suite 3, First Floor, City Arcade Office Tower,
207 Murray Street, Perth WA 6000
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The Link to nationwide freight transport.

Sentinels ...of safety

Safety does not depend on equipment. On even the most automated transport system, safety ultimately rests upon people. Upon diligent, dedicated and trained people, with rules to tell them what to do and what never to do, and inspectors of various kinds to train them how to do it, and ensure firmly but fairly that they do it well.

This is called discipline, and discipline is the essence of a safe, well-run railway.

Safety equipment protects the disciplined railwayman against making an error.

The more times he or she does something — particularly under pressure, in adverse conditions — or the more routine and unthinking the action becomes, the greater is the statistical risk.

The greater the need for safety equipment to protect against human fallibility then becomes.

Signals are the most visible form of railway safety equipment.

Today, these sentinels of safety are much less visible than they used to be, less intrusive and more expensive.

Gone are the great signal gantries with their splendid forests or route-indicating semaphores, that stood guard at the gates of our great railway termini from the days of jolly King Edward to his great grand-daughter, Elizabeth the Second.

Here in Australia we have not yet suppressed the lineside signal entirely, and brought its indications right into the Driver's cab.

But others have, at the very high cost of a total fit-up of all the tracks and all the locomotives or multiple-unit train cabs involved.

It takes a lot of traffic, and a lot of trains, to justify this level of investment.

At the other end of the scale, there are still railways — even here in Australia — with few if any signals at all.

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Main picture: Signal gantry, Adelaide North Yard.

But when trains become faster or more frequent, and particularly when they interact more — converging and diverging, overtaking and crossing, leading and following — the margins for error increase, and they increase at a rate that is more rapid than most people tend to think.

The Need for Safeworking Equipment and Signals

Consider, for example, a simple, single-track branch line from junction A to terminus E.

Consider a single train making the round trip, A to E and back to A, in eight hours.

There is no need for signalling beyond some authorisation for one train to move out from A, and a foolproof check that only one such authority is issued.

The Driver could, for example, carry with him the only authority to proceed on this line in the form of a simple "line-clear" baton or token (called the Train Staff).

If however, a second train is to depart from A (say) eight hours later, it must arrive at E before the first train returns.

Proving this is still fairly simple — the token could be shown to the first driver to depart.

And having seen it he could proceed to E on the authority of a signed and countersigned line-clear "ticket," waiting at E for the second train to arrive and with it the Train Staff, before he returned to A on a second line-clear "ticket."

This is called "Staff and Ticket" working.

If, however, it was required that the first train did not wait to return, but started from E when the second started from A, the two trains would have to cross at the mid-point station C.

With a denser service still, crossing operations would be necessary to A, B, C, D and E. Staff and Ticket would work, but "Electric Train Staff Working" (electric tokens) was more commonly used on such lines.

Our eight-hour service frequently involved but one train and one "crossing" at A, a four-hour service two "crossings" per trip, a two-hour service four intermediate crossings per run and four runs made, i.e. 16 times the number of train-crossing operations at five separate places.

By now there is considerable scope for human error — particularly if the operation is to be on paper authorities alone, i.e. no baton is carried to enter each single-line section between two stations.

Above: The old Market Street gantry at Flinders Street Station, Melbourne. This gantry of route largest ever built and only recently demolished with commissioning of the Underground Loop. A train approaching Flinders Street (from right to left) on the track under the left-hand group of of 13 tracks, and one arriving from the far track, onto any one of 9. The small disc signals are f worked by pull-wires, but when the train passed the signal a track-circuit operated an electric " arm) which reset the signal to danger automatically. To read tracks from left to right, you counte to right, thus tracks 1-2-3 down the left hand post, then tracks 4-5-6- down the next (i.e. second hand group the signal for the 11th track was the lower arm on the 4th post from the left. One si would have been easier to interpret (and a lot cheaper!) but only from close range.

'Safety protects the disciplined railway man from making an error'

There is even more scope for trouble if a train runs late, and the normal routine pattern of movements laid down by the working timetable is upset, requiring a controller or despatcher to issue orders accordingly.

The converse is also true. In the days of King Edward, everyone but everyone travelled by passenger train, and the freight trains were shorter and more frequent.

Today, there are few local passenger trains on country lines, and many Australian railways are freight-only (sometimes even seasonal-only).

And goods trains have doubled, tripled or quadrupled in length, reducing the number of trains and even more dramatically, the number of crossing operations on a single line.

It then becomes possible to pull out crossing loops and on double lines, even to pull out long stretches of one complete track, retaining the other track as a modern reversibly-worked single line, under Centralised Traffic Control (CTC) which we will encounter later.

With today's technology, the CTC Despatcher need not even be on the railway; there are in fact sound administrative reasons for locating him in the HQ Office.

If the Despatcher goes home by car or bus, he or she may never see any of the trains that are controlled from one month's end to the next, anymore than the Enroute Air Traffic Controller in the windowless room at Botany Bay

will see the big Boeings that he or she brought in from Fiji or Auckland.
But although today's CTC operator on any railway in the world does much the same thing with (functionally) much the same kind of equipment and control, it was not ever thus.
For the paths that railways followed in Britain and Australia, compared with those in North America and on the Continent, were quite different paths — different right from the dawn of railways, right up to the present day era of CTC. Even when automatic block signals came in on single lines, they had quite different purposes and meanings in different countries.
And what may well be the greatest surprise of all to the reader is this: even when British-inspired railways (including ours) were still using oil-lit mechanical semaphore signals, and single-line electric token instruments, these antique 1880-era technologies were, right up to the installation of CTC in very recent times, **demonstrably and fundamentally safer than the more "modern" technologies of automatic electric block and colour-light signals as used in the USA.**
The reason lay not in the technology, but in its purpose and in the way it was used.
The root cause of this difference is not technical but cultural. And each culture traces right back to the dawn of railways over 150 years ago.

Britain

The Stockton and Darlington Railway on which steam engines first ran in 1825 was, like most of the primitive horse-operated "plateways" that preceded it, a single-line. (If we neglect its sole horse-drawn passenger coach, the S and D could also be fairly described as the world's first "heavy-haul" railway).
But the S and D differed vastly from the Liverpool and Manchester of 1830, and from virtually all the main lines built in Britain for the next four decades.
For all of these railways were **double** track, with separate "Up" and "Down" lines that reduced the collision-prevention problem to one of avoiding trains overtaking and converging with each other.
The hazards from careless shunting on a running line, or trains breaking apart en-route, are common to both single and double lines.
From the early 1830s, policemen were employed by the English railway companies.

'Today, these sentinels of safety are much less visible than they used to be'

They were sworn in as special constables, and issued with handsome uniforms, warrants of authority, and hourglass-shaped timers (like a big timer for boiling eggs) to preserve a time interval between following trains entering each "block" of line.
The policeman also protected any shunting that might obstruct the through line.
The first fixed signal was installed, to extend the Driver's "sighting" distance of the policeman's arm or flag, as early as 1841 (some authorities say 1834) and by the 1850s primitive signals were, if not universal in the UK, certainly in wide use.
This made the policeman a signalman — and even today you will still occasionally hear an English engine driver hail the signalman in an old-style lineside signalbox with the ancient nickname of "bobby."
The Great Western Railway installed the electric telegraph in 1839. From the outset, it was used to notify train movements that were exceptions to the timetable.
The telegraph **regulated** train movements, but it did not **protect** them until the "absolute block" system of allowing only one train in a section at a time was used (at Clay Cross Tunnel) in 1841.
Full block protection of complete main lines started to appear from the 1860s. Remember that we are still talking about undirectional flows of trains on double-track lines.
Also from the 1840s, the policeman's lot was made a happier one by grouping the control levers of his signals together in the one frame, and primitively locking their actions to prevent his signalling two conflicting movements.
A French railway first used this in 1855, John Saxby applied it extensively from 1856, the first **fully** interlocked installation of points and signals dated from 1859.
The ordinary commercial or "message" telegraph had evolved, too. Called the "speaking" telegraph and still rather quaintly referred to in some Railways' Rules as an Electric Speaking Instrument, (the other being Mr Bell's telephone!) this had by the late 1850s become a specialised railway device, based on telegraph technology but serving the functions of a "Double Line Manual Block" instrument.
If placed by some magic in such a signalbox of 120 years ago, there are very few Australian signalmen of today who would feel totally out of place, or who would be unable to work trains with a comforting degree of security, after relatively little instruction on the antique block equipment and lever frame. For the principles are the same as those of the equipment still found in many country signalboxes today.
True, there were many places in the UK where policemen still flagged following trains through on time-interval or "permissive" forms of block working, and threw the unlocked points from the ground in front of them, potentially without warning to the Driver.

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But the traffic densities were spiralling rapidly upwards through the mid-Victorian years, with headways between scheduled following trains as little as 7-10 minutes, and as Queen Victoria had herself desired, "separate lines for luggage."

The same signalbox — and signalman — now worked not two, but four and in some places even six tracks.

The poor signalman also worked very long shifts indeed; 24 hours was by no means exceptional.

It was mounting train densities in a compact country that essentially set the pace of installing signalling equipment in Britain.

Public and Parliamentary reaction to each bad smash was reflected in increasingly tough Regulation of Railways Acts (1842, 1870 and after the Armagh wreck in Ireland, 1889).

These gave the Board of Trade Inspectors the teeth to enforce the dictum of "lock, block and brake," and they did this on **every** line in the Kingdom.

The same concepts were exported with British-trained engineers to all the colonies, including the Australian ones.

By 1892 all the vital elements that inherently make a modern double-track railway safe were present, save four:

- continuous automatic power brakes on freight as well as passenger trains.
- detection of a train by a track circuit, wherein the wheels and axles short-out the rails.
- the superior visibility of the electric colour-light signal.
- protection against a Drivers over-running a danger signal.

Modernised forms of the pre-1892 and later vital safety elements remain the norm on Australian railways today.

There is one more: rolling stock that is expressly designed for crashworthiness should an accident occur.

And the human factor? On the old company lines there was no doubt of pride, discipline, and continuity of service — all the essentials needed for a dedicated staff to speed the Company's passengers on their way with very, very high standards of safety.

To restate: the basic approach in the UK was double-line oriented from the outset, involving closely-spaced stations, frequent and numerous signalmen on the ground, and increasingly dense traffic that gave a strong **commercial** incentive to regulate traffic with mechanical appliances that, at only a marginal extra cost, also protected the traffic with a very, very high inbuilt level of security against error.

That situation applied as far back as 1892, and, on the better UK lines, over a century ago.

Single lines were few in the UK. Where they existed, the single-line baton (staff and ticket) system was introduced from 1860.

Several patented, electric replacements of it, permitting the issue of only one token at a time from electrically interlocked "Single Line Electric Token Instruments" were introduced by Edward Tyer in 1878.

They permitted each train in a series of following trains to carry a baton. Their use became universal through British-influenced railways and **only today is the modern CTC system replacing them.**

Here in Australia, our Public expectations of railway safety were British from the outset, and have always been essentially British.

They are very high expectations by international standards.

'With today's technology the C.T.C. Despatcher need not even be on the railway'

Below: Old-style Semaphore Signals. A typical V/Line installation using McKenzie and Holland centrally balanced semaphore arms, this "bracket" or "junction" signal indicates the setting of the points into clear tracks beyond ("route" signalling). On the middle post, the top arm refers to the straight-through track, and the arm immediately below it, to the next through track to the right. The two arms on the right hand post (set lower) refer to the subsidiary tracks still farther to the right. The single arm on the short post to the extreme left refers to the through track on which the diesel loco is standing. The circular disc signals cover shunting movements and rotate about a vertical axis.

Flinders Street "A" Box — one of the largest all-mechanical signal boxes in the world the old "A" box had some 300 levers in two back-to-back frames. It has been preserved.

Our great signal engineers were British-trained and our signal companies were British-owned for the best part of a century.
Even today, our small community of railway signal engineers meets as the Australian section of an international but British-based learned society, the Institution of Railway Signal Engineers.
The IRSE is not a club or a debating society, but a chartered body and a setter of demanding professional standards.
Its Members and Fellows have been tested by their colleagues against very high standards of professional knowledge and experience.
Safety, and specifically the failure-to-safety ("fail-safe") principle, are ingrained into every railway signal engineer, regardless of whether he or she works for a railway, a manufacturer or a consulting engineer.
Thus Signal Engineers are the most conservative of all railway engineers, with Brake Engineers running a close second.
It has always been thus, and for as long as they have to protect our train from accident, we may hope this situation will continue.
As users, we can thank (or as railway accountants, can blame) the great English Prime Minister, William Edward Gladstone, when he was the President of the Board of Trade, 146 years ago.
And Queen Victoria, (God Bless Her) who had egged him on with frequent handwritten exhortations advocating safer trains and those Separate Lines for Luggage.

North America

Earlier in this article we saw how the Australian railways' basic approach to signalling was and still is

The first fixed signal was installed to extend the Driver's "sighting" distance of the policeman's arm or flag'

fundamentally British in **safety** terms, and how the last-generation of equipment that is being replaced here today is British in traditions, practice, and substantially, origin.
Yet the **operating** approach to our modern signalling is rooted not in the UK but squarely in America, where signalling arose for totally different historic reasons, and was developed along totally different technical lines.
Few Australian railwaymen — and even many Australian signal engineers — will have thought much about this difference.
But the difference was there, and it was very real, primarily for the simple reason that unlike the UK and like Australia, most American lines were and are single-tracked.
This simplification, however, masks a vital difference, rooted in environment, railroad operating culture and the evolution of working rules.
With these there developed a totally different approach to signalling the American railroad.
The difference further explains why, necessity being the mother of invention, fundamental and vital innovations such as the track circuit, the automatic block operation of signals, the power-operated semaphore arm, the colour-light signal and Centralised Traffic Control (CTC) were all American in origin, why all more widely applied in America at an earlier date, and even why some were stoutly resisted as irrelevent by the British.
For behind the mass of superior technology, the American operating culture of the time was (by our standards) alien, unacceptable, and relatively unsafe.
Lest this rather smug statement result in cancelled subscriptions and an angry letter from the Association of American Railroads, it will be defended in depth, and the reader will be allowed to form his own conclusions about whose train he would have felt safer in before (say) 1925.

Early US Safeworking Practice

The railroad appeared in North America exactly in parallel with the railway in the UK, and was separately developed as a native American technology.
The South Caroline Railroad opened under steam in 1830, and the Baltimore and Ohio the same year, with steam in 1831.
But even in the eastern US, the population was thinly-spread by the standards of the Old World. Charles Dickens tells us how the dark woods reached close to the young eastern cities, and the railroads that were built through them were laid only as the single-track lines that the traffic could afford.
Only as America expanded, populated and industrialised were some of these single lines doubled and in a very few cases, quadrupled.
But multiple tracking was resisted in America, which from quite early days tended to go for bigger trains rather than more trains and more tracks to run them upon.
And single track remained the norm.
The fundamental American operating philosophy reflected these conditions.
It was not to change for a hundred years and in the so-called "dark" territory of no electric signals and no Centralised Traffic Control (CTC), much of it remains today.
That philosophy was rooted on the rock — the shifting sands? — of a basic principle; the timetable existed not only to **regulate** train movements, but also as the basic safety tool to **separate and protect** them.
The whole American system grew around this principle from about 1850; the same principle became increasingly alien to the British from this time.

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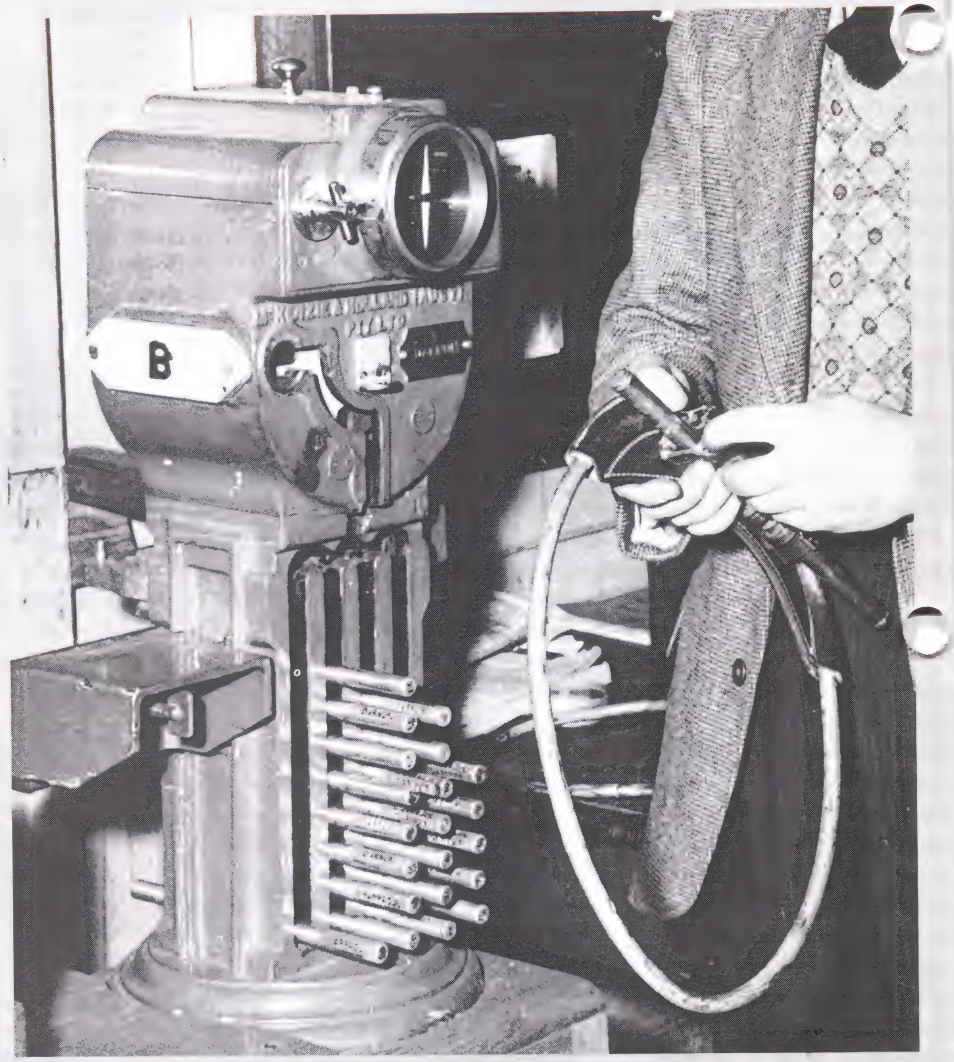
Practice generally diverged, rather than converged, for the next 75 years.
Specifically, the American railroad timetable and the operating Rules issued with it conferred on each train a particular status, priority, and right of passage vis-a-vis every other train.
The **right** to "go," rather than the **requirement** to await permission from the policeman to start (as in the UK), was fundamental to this American system.
Under it, the Conductor of an American train was in effect required to "navigate" his train along the railroad through all the potential obstacles of other trains having inferior or superior rights and hopefully, never exactly equal rights.
At one place, the Conductor would be expected to stop, throw the points, shunt clear into a siding, reset the points and wait for another oncoming train to cross, or a following train to overtake.
His own train crew and **not** the ground staff (where there were any) would flag that other train through.
At another place, the conductor would **expect** to run through exercising his priority rights.
Thus an "inferior" train would be required to "get in the hole" (i.e. the crossing loop) and to "clear the switch" i.e. set the points for the main line × minutes before the "superior" train was due.
For the superior train, it was full speed ahead, and hold the schedule at any cost.
These conditions were not merely guidance for expediting traffic and avoiding delay to priority traffic — they were fundamental to the safety system, i.e. to decisions of who went and who waited.
Before the electric telegraph, all that the Conductor had to help him was a timetable, a turnip-sized watch, and an often ambiguous set of Rules. If a train broke down or ran late, it automatically lost its status, and with this its "rights" of passage, after a prescribed delay.
If the breakdown happened in the mid-section, the delayed train would, upon restarting, have to be navigated forward at walking pace, preceded by a flagman on foot — who might or might not meet his colleague walking towards him.
He might or might not be able to stop an oncoming train, whose crew was pushing ahead into the unknown, or had misread a timetable or had forgotten all about the other train at all.



Single-line electric train staff instrument (McKenzie and Holland type). There are 21 staves in this instrument (and possibly another dozen in that at the opposite end of the single-line section) but the locking permits only one to be withdrawn by the signalman and thus only one train to be in section at the time (V/Line).

The delayed train became not a source of vexation, but of disaster.
A delayed train would have to use gaps in the schedule between oncoming trains, or let the train behind it run ahead, on schedule and using its rights, but with white flags hoisted (unscheduled extra train following) and the late train sneaking along behind, in the same section.
The timetable might imply that no train would be in a given section of line. But it did not guarantee this, and in this lack there lay the causes of great danger.
In an attempt to overcome the problems of trains that did not appear when and where they were expected, complex rules were laid down by some railroads permitting unscheduled movements in a particular direction over a particular section, only during odd or even hours.
This time-based approach was not very satisfactory, and the special or excursion train was a source of extra trouble.
From the earliest day, it figured well above average in the incidence of wrecks.
This was because unless the word was passed to **everyone,** such a train would be unknown and therefore unexpected.
As traffic built up the railroads ran more trains, longer trains, and in due course faster trains.
The incidents of trains meeting in mid-section while the crew argued rights of passage then changed from the hilarious to the tragic.

'Signal engineers are the most conservative of all railway engineers'

'Only as America expanded and industrialised were some of these single lines doubled'

Telegraphic Train Order System

In the US as in the UK, the Morse telegraph was introduced in parallel with and strung along the new lines of railway.

In 1851, Charles Minot, a Traffic Superintendent on the Erie Railroad became exasperated by waiting for a long-delayed train at a crossing station, and telegraphed ahead to locate it.

He then instructed that it be held.

When the engineer (Driver) of his own train refused to proceed, Minot himself drove through a succession of stations, at each of which he again used the telegraph system to re-check the location of other trains and his authority to hold them.

Minot's action by-passed all the operational problems of a dislocated timetable, and formed the beginnings of the Train Order System.

But the timetable, with the navigation rights of trains that it laid down, and the requirement to get off the main line and set the points in time for superior trains to pass, still remained the basic American safety tool.

For many years all that Train Orders did was to manage by exception, i.e. attempt to regulate **alterations** to the timetable and temporarily cancel the corresponding "rights to go" that it conferred.

Whenever the system failed in that attempt, the risk of accident arose.

Under this system, truly a dreadful way to run all but a very lightly-trafficked single-line railway, the Train Despatcher was installed at the Divisional HQ, and provided with one or more telegraphists in direct communication with every station where there was a Station Agent (telegraphist/ticket/freight sales Agent) on the ground.

This did not, it should be noted, mean communication with **every** station 24 hours per day (the British pattern), nor did it cover all places where a train might be required to shunt off the main line to effect a crossing, or allow a superior train to run through.

In the UK, comprehensive communication was an express Board of Trade requirement after the Abbots Ripton wreck in 1870; the last bad British head-on crash under telegraphic working was the Radstock accident on the Somerset and Dorset Railway in 1876.

By this time telegraphic train orders had long been the norm in North America.

The Despatcher was **supposed** to keep track of all the train movements by combining what the scheduled ones were supposed to be doing (from the timetable), with the exceptions such as conditional "paths" that were being used on that day, late departures, breakdowns, specials, extra sections, excursions, ballast trains for trackwork, etc. reported to him by telegraph.

He had a train graph on which he plotted trains to assist in this.

On the busier and better railways, there was a very comprehensive system of telegraphic reporting. But by no means on all railroads.

Given all the pieces of the puzzle, the Despatcher then fitted them together in the best way.

He decided amendments to the timetable, and wired them to the Station Agent(s) concerned.

The Agent flagged the train down or set horizontal the "train order" board for the appropriate direction (one of two semaphore signals on a post near the station office) to advise the crew he had orders for them.

Orders were normally written down "off the train wire" in triplicate — one for the Station, one "flimsy" for the Engineer (we will call him the Driver) up front, and one for the Conductor in his caboose at the back of the train.

Orders were picked up on the run.

The train crew then acted under the Conductor's personal responsibility, to navigate their train per amended instructions.

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Below: The time-honoured ritual of handing up the staff. The station master, observer and driver will each independently check that it's the right staff for the section ahead, and therefore safe to proceed. (V/Line).

Hopefully, everybody got his act together. And her act — for well before 1900 there were lady telegraphists and Station Agents.

In no way was the Station Agent the equivalent of an English railway policeman or Australian station master or signalman on a single line.

The Station Agent was merely a telegraph clerk — a necessary go-between before the days of on-ground telephones and later, radio that permitted direct communication between despatcher and train crew.

The train crew still unlocked (opened and reset the main-line points, and they still flagged the other trains through.

The Conductor was still the captain of his ship of the rails. He still exercised unchanged "rights' over other trains, and his rank over the engineer (by legend, said originally to have derived from a memorable first-fight in the earliest days of Eastern US railroading).

The train orders could still call for a crossing at an unattended place, such as industrial or factory spur, where there was no telegraph at all.

Hazards and Consequences

And compared with the simple Rules governing double-line block operation on an English railway, American Rules were formidably complex.

For many years, they were also different between different railroads. Conductors were hand-picked men. They had to be.

Also, being a purely paper-operated system, there was maximum inbuilt scope for human error.

The telegraphists in the Despatcher's Office might be tracking 15 or 20 trains through their Division, and sending and receiving hundreds of messages daily.

They were not only "vital" messages for the protection and regulation of train movements; the same wires hummed with countless instructions to add cars here, drop them off there, locate lost consignments, and confirm this or that passenger's through booking to Chicago.

The Station Agent likewise had his ear ever-cocked to the clicking of his telegraph.

Operators might be tired from very long hours, physically or mentally unfit, confused, perhaps even drunk.

The Despatcher might be forgetful of a train, or forgetful when he fixed an unusual movement, that perhaps **three** trains were involved at a crossing and not just two.

The Agent might forget to pass the orders up. Station names might be confused or wrongly transmitted; many names were changed as a result of near-misses and nasty frights.

Or train numbers might be transposed. Extras and conditional second sections might not be advised; the famous **20th Century Limited** often ran in up to **seven** closely-following parts.

True, the system had an increasing number of inbuilt check as the years passed, but they were paper checks, unbacked by any mechanical single-line safety appliance such as the baton or Electric Train Staff.

As this would have required trains to stop at the unattended block posts that had never been accepted as necessary, it remained generally unacceptable in North America; there were a very few exceptions.

And so, as traffic density and operational complexity grew, so did the opportunity for error, the rate of error, and the number of head-on mid-section collisions.

'In the U.S. as in the U.K. the Morse telegraph was introduced in parallel along the new lines of railway'

In some of them the errors became evident and the local doctors were being called out before the trains hit.

There were sound reasons why the American railways introduced air brakes and strong steel cars long before the British and Australian railways found it necessary.

In America, the trains crashed more often.

Another practice encouraged the rear-end collision.

This was the old "time-interval" practice of allowing a train into a section (single or double line) 10 or 15 minutes behind the preceding train, and relying solely upon the first train's crew to protect its rear if it slowed down or stopped in mid-section.

This routinely posed awful dilemmas for the first train's crew.

If for example, a freight was sent on ahead of a fast mail running late, the freight had to reach its refuge, go into the hole, and set up the through track within the prescribed safety interval (in minutes not distance) to clear the line.

But what did a Conductor do when the engine up front ran short of steam or slipped on icy rails, and the planned safety gap steadily narrowed?

How did minutes of time translate into safe braking distances, up hill and down dale? And anyway, exactly where **was** the train, in the dark snow-bound night?

Should the Conductor let the engineer up front struggle on with his sick locomotive, hoping for the best? Or pull the air, to apply the brakes and stop, drop a rear-end brakeman and protect his tail, literally?

The prudent decision would mean an additional delay of at least 20 minutes to **both** trains, and a "please explain" from the Super late.

Great indeed was the temptation to stay in the warm caboose, throw a 10 minute fusee (a slow-burning red firecracker) out the back door, and hope that the next train would see it if the gap narrowed to eight minutes.

And even if the brakeman had been dropped, could he be relied upon to go back far enough? Did he have enough fusees and torpedoes (detonators) with him? Would his lantern go out, his matches fail to strike? Would he and his light be seen by the following train in time? Was there a high trestle bridge in the way, which might take the flagman 10 minutes to crawl across, on hands and knees in a howling gale?

Air brakes saved hundreds of lives between 1870 and 1920, but often in reducing impact speeds rather than avoiding impacts as such, for many an American express slid over icy rails into the rear of the train ahead at speeds of 70 km/h or less.

But that was quite enough with the heavy trains involved.

An interesting social side light was that the Ruling Classes in the plush observation car, and industrial tycoons

and railroad presidents in their private cars hooked on behind them, stood a higher risk of being smashed up in a rear-ender.

The mail and expressmen in the head-end cars, and the travelling salesmen in the smoker, all had a big, solid Baldwin 4-6-0 or Pacific locomotive placed between them and trouble.

As the reverse was true in the case of head-ons (cornfield meets), one's Pullman needed to be at least four cars from the front or the back to be perfectly safe. Obtaining such a reservation was difficult on a 5 or 6-car Limited.

The Human Element

All of these weaknesses were compounded by the pressures of competition (speed, punctuality, excessive speed) and by the proliferation of railway companies, many of whom were financially shaky.

In agricultural regions, some companies retained only a small core of regular outdoor operating staff — usually Agents, Engineers (Drivers) and senior Conductors — on their permanent payroll.

The other staff where hired and fired according to traffic demand, i.e. to the seasonal or economic cycles, or the competitive position of the line.

These quasi-casual railway-trained employees — the colourful "boomers" of American railroad folklore — moved around the country from system to system.

While it seems that most were responsible, broadly-experienced people (many of whom had seen the results of careless or reckless operation) there was a strong element of machismo in the boomer culture.

And the nature of the industry was to reward the successful operation risk-taker, i.e. the man who lived on his nerves, who held schedule, and who was lucky.

The boomers could not have been easy people to tutor in the essential principles of safety first, second, and third, or in the local knowledge in depth that is essential in taking knowledgeable, least risk decisions.

Nor would it have been easy to weed out the accident-prone element, or to discipline those wanderers effecitvely

'In the Old America, then, there was near total reliance upon the human factor'

in a happy-go-lucky young frontier country.

So the boomers were hired and fired frequently.

The inevitable result was that despite the compulsory introduction of air brakes, knuckle couplers and in the present century all-steel passenger cars, and despite the efforts of the companies, (some) State authorities (most) and the Interstate Commerce Commission (all the time) to standardise rules and police safety, the accident record of the US railroads from 1870 until well after World War I held steady at a level that was appalling by any standards other than its own.

Its root cause lay in fundamental operating philosophies and practices that would not have been tolerated by contemporary British and Australian main line railways, nor on most Continental European Systems.

The Canadians were probably somewhat better, and the Mexicans probably worse.

On station layouts, the Board of Trade insisted that halted trains be properly berthed in loops and sidings, clear of other running lines.

Not so in the States — a train might halt at a depot plumped across the Y of a double-track junction, with its cars blocking three of the possible four main-line roads.

Unless a busy centre, there would be few signals. This added to the risk of collisions from stray shunts and overshoots.

And even on the highly respectable Canadian Pacific, in the late 1960s, the writer's dome-observation car was parked diagonally across the loop points, illuminated by the on coming headlight of a heavy transcontinental freight — four big diesels, and 117 on — as it pounded into the loop at 30-35 km/h.

True, the domeliner restarted and drew clear, with perhaps 200 metres to spare in a perfectly timed crossing.

But it would never have been done here.

In the bad old days things were infinitely worse. Safety was the dark, seamy side to the romance of old American railroading.

The happy patrons rushed to board the steamcars and rode in the glittering palaces of plush, plate glass, and elegant gilt panels and matchboarding.

They were borne on wooden bogies, lit by kerosene or gas, and warmed by cast iron stoves.

The combination of safeworking practice and equipment assured a swift despatch; if not in the wreck, in the fire that often followed.

In the old America, then, there was near-total reliance upon the human factor. You travelled for hundreds upon hundreds of kilometres at speeds up to 100 km/h, and the only visible thing that even remotely resembled a railway signal would be the train order boards, the highball signal at a flat crossing of another company's railroad, or the dim kerosene light of a ground-level switch stand.

You passed dozens of hissing steam engines, and hundreds of railroad employees, mostly trainmen.

(Hopefully they were dedicated, sober, alert and co-ordinated by Morse telegraph and paper flimsies.

Certainly they sped you on your way with a cheerful wave of flag or lantern.

And unless your luck ran out the steamcars got you there — on time and, well, more or less safely. With negligible help from safety appliances.

Yes, Mr Gladstone and the Board of Trade would have been appalled. So would the Commissioner of a contemporary Australian railway.

But in such a way the West was won.

(The second article in the series will introduce automatic block signals, and show how their early use — and abuse — led to today's safe signal systems and the introduction of Centralised Traffic Control).

THE INDIAN PACIFIC

The Federal Minister for Transport, Mr. Peter Morris, addresses the crowd upon the arrival of the first Indian Pacific. Seated near Mr. Morris are AN general manager, Dr. Don Williams and South Australian Minister for Transport, Mr. Gavin Kenneally.

The world-famous Indian Pacific passenger train incorporated Adelaide in its itinerary during August for the first time since it began operating in 1970.

The premier passenger 'flagship' of the Australian railways received a big welcome as it arrived at the Adelaide Rail Passenger Terminal at Keswick on Sunday, August 17.

Adelaide is now part of the luxury train's 65-hour journey across Australia between Sydney and Perth. It currently travels the 3,961 km distance from coast to coast three times weekly in each direction. The luxury train features first class facilities including single and double sleeping berths, dining and lounge cars.

Accommodating 142 passengers on each train, the six extra weekly services into Adelaide are expected to significantly boost tourism into South Australia.

The Adelaide stop allows passengers to break their journeys and catch a later Indian Pacific to their destination.

The Federal Minister of Transport, Mr. Peter Morris, was among the passengers on board the first train.

The Minister was accompanied by AN General Manager, Dr. Don Williams.

Other Federal and State politicians including Federal member, Mr. Chris Hurford and SA Transport Minister, Mr. Gavin Kenneally were among guests.

Representatives from the travel and tourism industry also attended.

The decision to include Adelaide as part of the journey was initiated by Australian National in conjunction with joint operating rail authorities in New South Wales and Western Australia.

Hundreds of people lined the platform of the Ad

The Australian National institute brass band entel

"It will help improve the marketability of the service and add another dimension to the total journey for passengers," said Australian National

GOES TO ADELAIDE

Rail Passenger Terminal as the first Indian Pacific arrived.

s the public waiting for the arrival of the first Indian Pacific passenger train into Adelaide.

The information board tells the story — the inaugural run of 'Indian Pacific' from Sydney to Perth via Adelaide.

General Manager, Dr. Don Williams. The Indian Pacific first linked the oceans between the West and East coasts of Australia in February 1970.

The new service eliminated four changes of train and cut travelling times between Sydney and Perth dramatically.

The Indian Pacific has become renowned for its first class service and spectacular views as it traverses the Australian continent.

(continued from page 35)

BR is also introducing an "open stations" policy. Unlike most of Europe, passengers in Britain have to show a ticket at a barrier to gain access to the platform.

With open stations passengers no longer have to queue to get on and off platforms and with BR carrying out ticket checks on trains, more effective control is kept over fraudulent travel and better use is made of staff.

With investment going ahead in many areas, prospects for British Rail look much brighter than they did three years ago but there are still clouds on the horizon.

One of these concerns the railway networks around the big cities in the north of England.

There, continued local authority funding of local railways is in doubt in the face of generally reduced local government spending.

Another factor is that bus companies, encouraged by central government policy aimed at stimulating competition in local transport, may entice many passengers from these urban railway lines.

The other major headache facing BR at present concerns its freight business. Some 60% of the freight carried by BR is coal, most of it destined for electricity generation at power stations.

The dispute involving Britain's miners which began in the spring of 1984 and lasted for over a year, severely affected BR's freight business and there will be difficulties in achieving the profit target set by the government.

However, BR is introducing a programme of economies (including eliminating the guard from many selected freight trains) aimed at achieving the target.

Large-scale growth of BR's freight business will probably have to await opening of the Channel-Tunnel. This project is just as eagerly awaited by BR's passenger businesses.

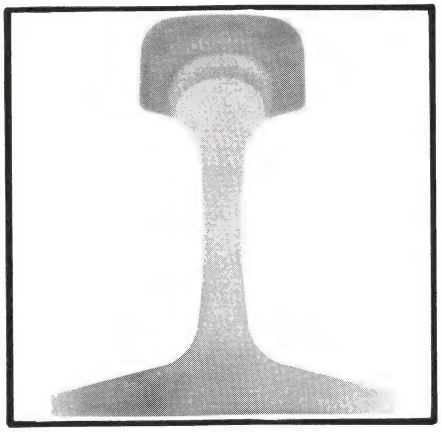
It will at long last have the effect of tying in Britain's rail system with that of the rest of Europe and should be welcomed by railwaymen all over the continent.

HOT METAL...

Most of us are familiar with the blacksmith's forge in which metal is heated on an open fire before being worked.
Variations of this ancient principle use the more efficient furnace (electric, gas, oil or solid fuel-fired) or when the shape does not suit this, the specially-built flame-heating devices like the classic gas ring used to heat and expand the tyre rings shrunk onto older-style railway wheels.
Electric induction heating works on a totally different principle (which is, incidentally, different again from microwave or UHF radio wave heating used to cook food).
Induction heating works with metals because they conduct electricity.
If large currents are induced in a metal object at low voltages, by a strong magnetic field, the metal object's internal resistance causes it to heat — if necessary, right up to melting point.
The ability to control the magnetic field accurately enables this internal heating to be localised, applied quickly, and applied with the minimum consumption of expensive energy — and without any of the undesirable metallurgical side-effects of a very hot flame.
For these reasons, induction heating is becoming increasingly used in the engineering industry and by railways.
An Australian company, Inductoheat Pty Ltd of Melbourne and Sydney, has been a pioneer in railway uses of the technique and used it for a number of little-known but very effective applications in Australia and for export.

Spring Heating

Most railway workshops manufacture coiled and leafed springs. The coiled springs are generally made from 12-30 mm diameter steel and the length to be heated prior to coiling will vary depending on the end spring length.
The first operation requiring heat is to heat the ends of the bar to allow it to be tapered. This ensures that the spring has a flat and level surface on which to sit when it is in operation whilst also allowing it to be gripped firmly in the coiling machine.
This end bar heating application is generally up to a length of 150 mm.
The second heating operation involves heating the total length of the bar.



Head Hardening of Railway Track using Inductoheat supplied equipment.

This requires a continuous bar heater with magazine loading and feed out onto the coiling machine.
Once the bar has been heated, the operator then grips it with the tongs, places it into the coiling machine and the coiling machine automatically winds the heated bar onto a mandrel.
Upon completion, this spring is ejected from the coiling machine and the cycle repeats itself.
In the case of leaf springs, the main operation is for rolling the eye on the end of the springs; again this is an end bar heating application.

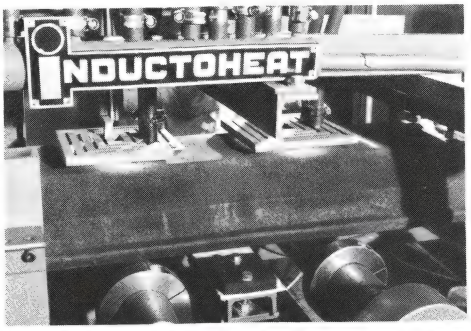
In addition, some springs are heated in the centre to allow a hole to be punched for the spring to be mated with other leaves.

Fishplates

While continuous welded track is reducing the use of these, fishplates are still being made by the million around the world.
This heating application with induction allows a strip to be heated on the fishplate to allow an upsetting operation to take place.
This heating job ensures that considerable energy saving takes place, instead of heating the whole of the heavy fishplate.

Dog Spikes

Dog spikes of various kinds — including new hammer-driven twist spikes — are used to secure rails to wooden sleepers.
Lockspikes similarly secure the soleplate under the rail to the sleeper.
Production of a spike involves heating the end of a piece of cropped steel prior to putting it into an upsetting machine for forming a head on the dog spike.



Left: Close-up of Sleeper Heater showing heated zones.

Below: 250 kW, 10 kHz Heating System Application — Spot Heating of Steel Railway Sleepers prior to hot upsetting.

Electrical induction provide

The current method usually involves heating a total length of bar, and hot cropping and heading in the one operation.
Combining induction heating with precropping in the cold state ensures that only 10% of the bar is heated, giving a 90% energy saving.
A number of these installations have been built by Inductoheat and all railway systems still use this method of fixing.

Railway Locomotive Tyres

Many railway systems still utilise railway tyres which are to be shrink fitted to the railway wheel.
This involves placing the tyre inside an induction heater and heating it to about 180ºC, which ensures that it expands radially.
After this, the tyre is removed, placed on the wheel centre, and it contracts back to its normal size.

Removal of Railway Tyres

This is normally a cumbersome job; tyre removal from a wheel has been observed to take three men up to 30 minutes.
With induction heating this can be achieved in a matter of a minute and a half.
The system operates whereby the entire wheel and axle is lowered into the induction heater.
Heat is applied for a period of a minute and a half after which time the wheel is lifted and the tyre is held by means of jacks which are then raised for the discarded tyre to be thrown out.
Once the tyre has been removed, the crane lowers the wheel and axle to the ground, reverses it and brings the other wheel onto the induction heater and the cycle is repeated. When chopped up, these discarded tyres are, of course, very good scrap for induction melting furnaces.

Bolts

Most railway systems require bolts for many applications ranging from as little as 12 mm up to 40 mm in diameter. Generally the heading operation is undertaken using an induction heater.

Machine Tool Bits

This involves the brazing of machine tool tungsten carbide inserts.
The cutting tool used on lathes, shapers, etc. is placed in the induction heater and heated to about 800ºC at which time the silver solder melts and is cooled with the carbide piece in position.

Steel Railway Sleepers

The railway sleeper is made from a rolled-trough (sometimes a flat strip) approximately 12 mm thick, and is initially cold bent.

Below: 100 kW, 450 kHz Gear Hardening Mac gears — up to 100 mm diameter.

Below: 1250 kW, 3 kHz Continuous Bar Heater Application — spring heating prior to coiling.

s total temperature control

Once in this state, the sleeper is then heated with four induction heating coils positioned in accordance with the rail section to be used.
Once the sleeper has been locally heated to about 1,000ºC, it is then transported automatically out of the induction heater into the press which punches through the steel and leaves a clip position ready underneath.
This operation also "cants" the rail seat typically 1:20 to incline the rails.

Elastic Fastenings

In lieu of using the dog spikes mentioned above, patented special spring-steel clips are used to hold the rail to a special soleplate (timber), to an iron lug cast into the sleeper (concrete), or to the sleeper itself (steel sleeper).
These clips are generally about 300 mm (12") long and are heated to about 1,100ºC prior to being bent into their final shape.

Heat Treatment of Rails

Rail replacement is a critical element of track costs. Head-hardened rail made at BHP's Whyalla works is heated by induction techniques and air-quenched.

Removal of Gears and Pinions from Traction Motors

It is necessary from time to time to remove worn pinions from the shafts of the electric traction motors used to drive diesel-electric locomotives and electric trains.
As the pinion is mounted on the end of the traction motor shaft, the coil is placed around the pinion to heat it up prior to it being increased in diameter and pulled off the shaft.
This involves a mobile induction heater. The same unit is used for heating up the new pinion and shrink fitting it onto the shaft.

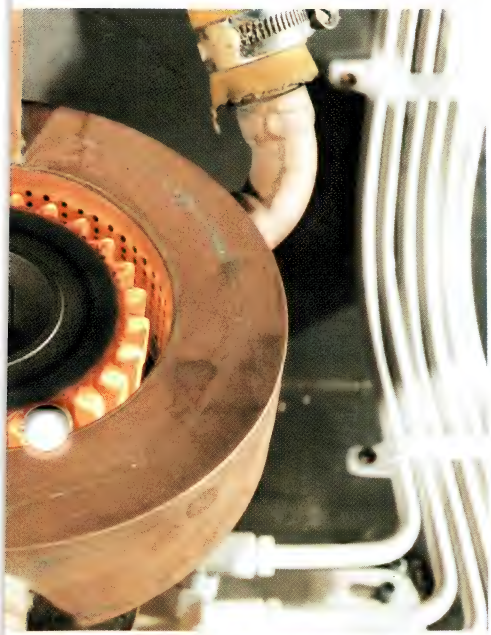
Forging

Most railway workshops have forging operations requiring billet heating. Induction heating is ideal for this application.

Pin and Shaft Hardening

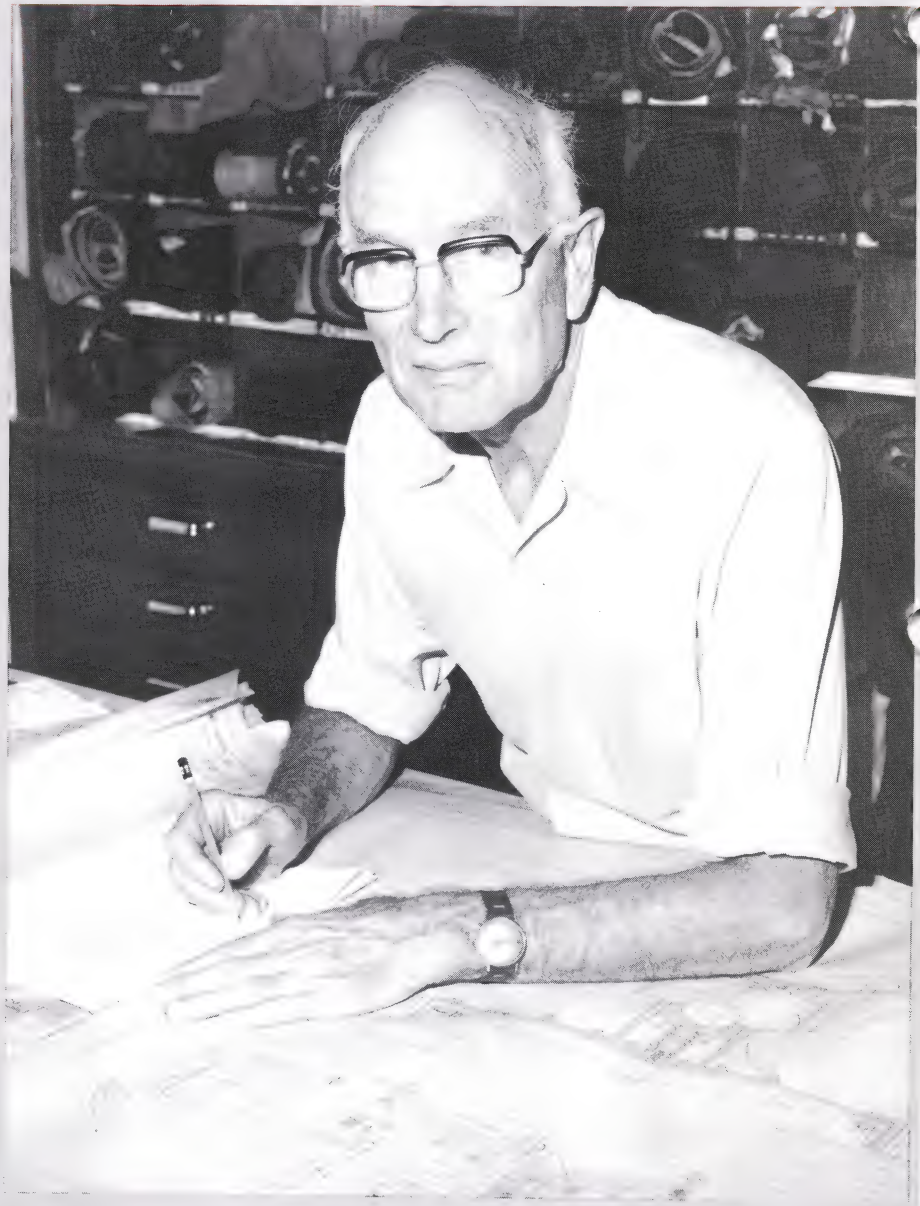
These applications require the heat treatment of shafts and pins that are used with rolling stock on such areas as the rigging that connects the air brake cylinder to the brake blocks, wearing pins on levers, pivots etc. and even — on those railways still using steam locomotives — main crankpins and valve gear pins, bushes etc.
An interesting sidelight of the move to induction heating has been the possibility of re-arranging other machines and processes in the immediate production line to achieve, overall, savings **additional** to those of induction heating itself.

plication — small diameter



Below: 1000 kW, 3 kHz End of Bar Heater Application — Pins and Bolt Forming.

Westrail drawings preserved for posterity



Ray Minchin

Ever wondered what becomes of the thousands of railway drawings from the steam era?

Westrail's Design Office at Midland has roughly 11,000 old steam-era drawings held in its strongroom. They were destined for permanent safekeeping in the State Archives, but first they had to be put into some accessible order for future researchers.

The rather sudden passing of Westrail's steam-era saw many of the drawings left in disarray.

The Mechanical Branch had virtually run out of employees with steam locomotive knowledge who could be spared for an extended period to bring the drawings into class and subject order.

The story of that immense task is the story of one man.

"We need to get someone like Ray Minchin," was a comment passed in discussion. Ray had been a regular visitor to the office seeking historical information for books and other publications he has helped to prepare, as well as drawings for his model making hobby.

Ray was approached late last year, and willingly accepted the task and challenge.

Ray's extensive knowledge proved to be invaluable.

His knowledge of what fitted where, what modifications were carried out and his mechanical aptitude made the task possible with the minimum of disruption to the Design Office and strongroom.

Nevertheless, the job occupied a taxing 11 weeks.

Ray had joined Westrail as an apprentice fitter in May 1936.

He resigned in 1947, after receiving a Degree in Mechanical Engineering at the University of WA, to become Assistant Mechanical Engineer for the Metropolitan Water Supply until, May 1949.

He then took up an academic career with the university and rose to the level of senior lecturer in Mechanical Engineering.

In September 1979, he was forced to retire early due to ill health.

But he has never turned his back on railways.

During his career, Ray studied many specialised railway mechanical engineer matters in Australia and overseas, including bogie tracking and performance and in particular the effects of wheel/rail profiles.

Such is his continuing interest that during his 11 weeks untangling the Design Office drawings he set aside his steam work for a time so he could join Midland engineers in their discussion of high wheel and rail wear.

He contributed a multitude of papers, sketches and calculations before returning to the steam drawings.

By May the task was complete.

The "Minchin Register," as it has been informally christened, is now in indexed order, ready for a permanent resting place.

Among those who will be most pleasant by the result are the many steam enthusiasts who buy prints of the drawings from Westrail.

It was the repeated searches through jumbles of drawings that caused some of the worst deterioration in their condition.

Now the drawings should be good for many decades of life.

Name a travel agency that cares as much about your booking to Ballarat as your beachcombing in the Bahamas.

When you want to go overseas, most people are only too willing to help. On the other hand, when you're planning a holiday in the same country or, heaven forbid, the same state, there doesn't seem to be the same amount of interest.

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Author chosen to write railway history

Well known Sydney author John Gunn has always had a passion for things concerning the sea and air... but for the next three years his feet and thoughts will be firmly on land.
Mr. Gunn, a former naval officer and Fleet Air Arm Pilot, has been appointed to write a history of the NSW railways following the decision to commission it by the State Rail Board.
Announcing the author's three year appointment, State Rail Chief Executive, David Hill, said that while many books had been written about trains, they were essentially for train enthusiasts.
"There has never been a proper and thorough history," he said.
The railways are one of the most significant industries in Australia's development."

The history will follow the development of rail transport in NSW since the first line was built in 1855, to the present day.

Its scope will include:

- The political, social and economic context in which the urban and country rail systems were progressively built.
- The significant economic and social developments for which the railways provided an impetus.
- The policies and characters of the major political, administrative and engineering personalities involved in the construction and management of the systems.

And that, in the author's words, will virtually be a history of the development of the State.

At the award of the Westrail Fellowship '86: Transport Minister the Hon. Gavan Troy congratulates the winner Mr Bob Allen of Lake King.

Farmer wins Westrail fellowship

A Lake King farmer, Mr. Bob Allen, has won the inaugural Westrail Fellowship, a $10,000 travel grant to study the grain growing industry in North America.
Mr. Allen left for Vancouver at the beginning of September, accompanied by Marketing Director Bruce Sutherland. The two will spend six weeks investigating grain transport, handling and storage in both Canada and the USA. State Transport Minister Gavan Troy presented the fellowship award to Mr. Allen at a ceremony in Perth.

Mr. Troy said it was timely that, as Australia was in the midst of negotiations to halt proposed US dumping of subsidised wheat on major Australian markets. Westrail should be presented an award related to the transportation of grain.
He said the proposed US action put added emphasis on increasing productivity for Australian produced grain and the Westrail fellowship award would assist that productivity.
The fellowship was conceived by Westrail and has been fully supported by the Primary Industry Association and the Pastoralists and Graziers' Association.
Mr. Allen was one of 33 fellowship entrants from all grain growing areas of W.A. He has been a farmer for 12 years, after a career as a teacher in Australia and Papua New Guinea.
He said that most important outcome of his fellowship win would be the need to persuade fellow grain growers that there had to be better integration of grain transport and handling in W.A.

Networks to spare?

Network recently received a letter from the daughter of a Train Controller employed by the State Rail Authority of New South Wales, Mr. John Cooper.
In the recent tragic floods which devastated parts of Sydney, Mr. Cooper lost part of his Network collection and is anxious to replace copies that are missing.
From our files, we have been able to supply Mr. Cooper some back issues — but if any readers have a collection which they no longer need and would be happy to pass on to Mr. Cooper, we shall be glad to put the parties in touch.
A brief note listing the copies available would be appreciated — and this should be sent to the Executive Director, Railways of Australia Committee, at the address above.

New standard helps disabled

The International Union of Railways (UIC), has given the go-ahead to a new specification designed to standardise conditions for the journeys of passengers in wheel-chairs.
The provision of coaches with areas and fittings specially equipped to simplify journeys of handicapped people represents a new boost for mobility of the disabled on a national as well as an international scale.
In future certain key dimensions in such coaches will be laid down to ensure minimum conditions for access and manoeuvre by disabled people using or confined to wheel chairs.
The ISO dimensions of wheelchairs and the information of specialist societies in the Netherlands and Sweden form the base of these provisions.

Access doors and corridors of 00 mm width are recommended and the maximum height of handrails and handles is also proposed. Special attention has been given to on train toilet facilities.
The vehicles adapted for use by the disabled will be specially designated by the UIC Pictogram and places in these coaches will be normally available through seat reservation procedures.
Coach designs of the CFF, DB, DSB, FS, NS, SNCF already make provisions for disabled travellers using wheelchairs in accordance with the UIC leaflet.
Further bilateral agreements will be needed for the design and provision of access ramps between coach and platform although the new leaflet establishes a maximum declivity of 17% and a normal capacity limit of 110 kgs.

Leading railway engineer joins Goninan

One of Australia's leading railway product engineers, Mr. Don Heumiller, has joined the Newcastle-based A. Goninan & Co. Limited.
Mr. Heumiller will be Engineering Manager, Railway Products.
He was Engineering Manager for Comeng (Victoria).
Goninan Chief General Manager, Mr. John Fitzgerald, said the company was gearing up for a heavy workload over the next few years, for projects such as the Tangara railcars, locomotives, new passenger cars, a high speed train, freight vehicles and bogies.
"We are delighted that Mr. Heumiller, who has developed extensive skills in railway technology, has joined Goninan at a time when our company is grasping new opportunities and markets," Mr. Fitzgerald said.
"The demands on our Engineering division have become extremely heavy and Mr. Heumiller will join Ron Lutz, our Engineering Manager — Products and Technology, in a program designed to meet those demands," Mr. Fitzgerald said.

Mr Don Heumiller

22 AN Years service for ROA

Australian National staff have already given twenty-two years service to Railways of Australia in the Melbourne office of the Directorate.
Standing — Geoff Hall and Don Perry (CENWAG) Seated — Bob Knight (Assistant Secretary and Philip Moran (Administrative Officer).
Bob Knight has been with ROA since the Committee evolved from the original Australian and New Zealand Railways Conference secretariat in 1975.

China tour stokes up for steam enthusiasts

Black Dragon Encounters of Belconnen A.C.T. is running a Steam locomotive enthusiasts tour through China on October 25.
The 19-day tour will cover Beijing, Harbin, Jiamusi, Shenyang, Datong, Chengdu and Kunming travelling on many steam operated lines.
A highlight of the tour is an 1,100 kilometre trip on the Chengdu-Kunming line which has 427 tunnels and 653 bridges.
The fare of $2,895 includes all transport, food (except in Hong Kong), accommodation and transfers.
Call or write to Black Dragon Encounters, P.O. Box 945, Belconnen A.C.T. 2616. Phone: (062) 581 1954.

Heading north through LangXiang Heilongjiang Province.

Powerful Experience

A Queensland joint venture for the Main Line Electrification Project

The CLYDE/ASEA-WALKERS joint venture provides Queensland Railways' Electrification Project in Central Queensland with a wealth of engineering experience. This powerful venture combines ASEA know-how and advanced technology in the field of AC electric locomotives, with the extensive experience of Clyde Engineering and Walkers Limited in the design and manufacture of rolling stock.

ASEA has more than 70 years experience in electric traction and in particular more than 15 years experience in electric traction with thyristor techniques.

Clyde Engineering Motive Power Division has been a constant supplier of locomotives and other railway rolling stock for more than 90 years. In 1948 Clyde became the first Associate of the Electro-Motive Division of General Motors Corporation to manufacture the GM diesel electric locomotive outside the domestic USA.

Since that time, Clyde has supplied over 1000 diesel electric locomotives to Australian Railways.

Walkers Limited has been involved in the design and construction of railway rolling stock since 1890. More recently they have supplied large numbers of diesel hydraulic locomotives and stainless steel EMU vehicles to Queensland Railways. A total of 280 EMU vehicles have been ordered so far, including the new inter-urban trains to run between Brisbane and Rockhampton by 1989.

CLYDE/ASEA-WALKERS is able to offer a strength of technical resource and wealth of design and manufacturing experience second to none.

CLYDE/ASEA-WALKERS

A QUEENSLAND JOINT VENTURE

CLYDE ASEA WALKERS

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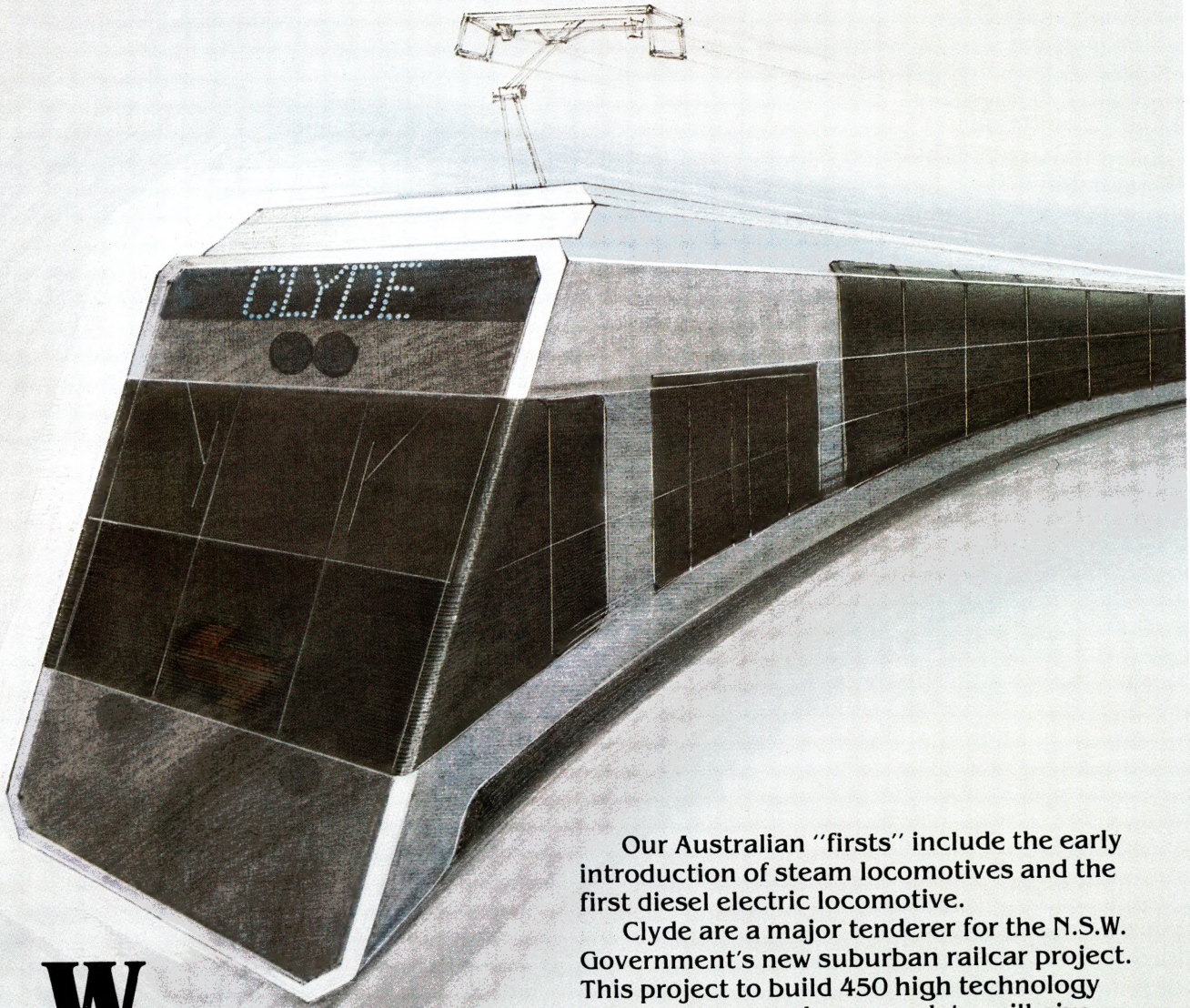
Travel beyond 2,000 with Clyde



We have been supplying locomotives and rolling stock to State and Commonwealth Governments since Federation and together with them have contributed to the development of our present transportation system.

Today, our trains are being designed for the twenty first century and beyond.

Clyde's engineers, together with their international licensors and partners solve design and technical barriers to build trains for the future.

Our Australian "firsts" include the early introduction of steam locomotives and the first diesel electric locomotive.

Clyde are a major tenderer for the N.S.W. Government's new suburban railcar project. This project to build 450 high technology passenger cars, when complete, will give commuters fast reliable rail comfort into the next century.

We believe our experience, research, technology and our discipline to produce on time and on budget, make Clyde Australia's most dependable company in rail transportation.

Travel beyond 2,000 is a Clyde commitment.

Clyde Engineering
Motive Power Division
Clyde Industries Limited (Incorporated in N.S.W.)
Factory Street, Granville N.S.W. 2142

Rail grinding in the Avon Valley

Out of the fire ... a smoother ride

Rail grinding has made a spectacular return to Westrail after an absence of some years.

The SPENO rail grinding machine has been putting a better running surface on important sections of the standard gauge.

In the Avon Valley it was used to "asymmetrically" reprofile tight curves so that bogie wheels will track with little or no contact between flange and rail.

Out east between Koolyanobbing and Darrine, the machine has ground faulty welds in the continuously welded track, eliminating the bad joints that batter sleepers when wheels pass over.

The 56 tonne machines has 28 individually angled grinding wheels, each driven by its own motor.

It carries 3,000 litres of water for putting out fires it accidentally lights, and in the Avon Valley during the dry weather was supported by an independent fire fighting team provided by the District Engineer, Perth.

For the crew, the grinding process is precise and exacting. Profiling a curve may require 15 or more passes to achieve the desired railhead shape.

The grinder has been on a contract to Westrail from Rail Maintenance Nederland BV, which normally keeps the machine on the North West railways.

In the Avon Valley, it has been used on the down-main (from Perth) to reprofile the old 47 kg/metre rail which has not replaced during the Kwinana-Koolyanobbing rehabilitation project.

Particular attention was given to tight curves and also to correct badly dipped welds.

It has put asymmetric profiles on curves using techniques first developed on the North West iron ore railways.

The process gives different profiles on the high and low legs of the curves, inducing the vehicle to track through the curve with little or no wheel-flange contact.

Grinding to correct welds on the up-main has not been necessary as that track was relayed with new, heavier 60 kg/metre rail at the time of the KKRP.

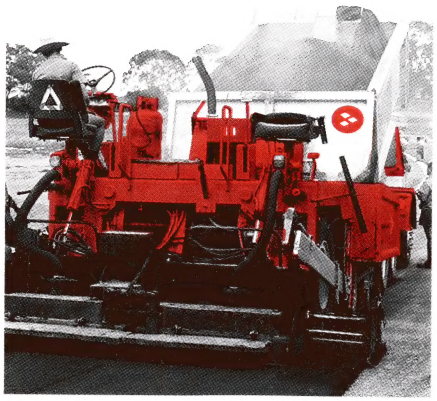
Between Koolyanobbing and Darrine the rail grinding machine was used to grind dipped welds, the condition of which had led to the imposition of speed restrictions.

In this operation, by grinding back and forth over the dip it was possible to remove enough metal to create a smooth joint and smooth ride.

The dipped welds in this section are a serious problem. They are not only interfering with the ride quality of vehicles, but are also causing very high loads on the concrete sleepers, ballast and track structure. Speed restrictions have had to be imposed.

Some of the projects we have been proud to supply include:

Casuarina Shopping Centre (NT)
Tooths Brewery (Sydney)
Canberra Convention Centre (ACT)
Botany Bay Container Terminal (Sydney)
Vicker's Heavy Engineering Works (Qld)
Langley Hotel (Perth)
Southern Mail Exchange (Sydney)
Canberra Building Society Office (ACT)
Animal Health Laboratory (Vic)
Department of Mapping and Survey (Bris)
Commonwealth Aircraft Factories (Port Melbourne)
Shellharbour Hospital (NSW)
Glebe Island Container Terminal (Sydney)
AMP Building (Perth)
Woolworths State Distribution Centre (Bris)
Port of Brisbane Coal Loader (Qld)
Traralgon Shopping Centre (Vic)
Coles National Headquarters (Melb)
TAFE College (Adelaide)
Burswood Island Resort & Casino (Perth)
Australian National Passenger Terminal (Adelaide)
Co-operative Bulk Handling Silos (WA)
High Point Shopping Centre (Melbourne)
BHP House (Brisbane)
Karrinyup Shopping Centre (Perth)
Yulara Tourist Village (SA)
Roxby Downs Township and Plant (SA)
Cassidy Shaft (Goldfields) (WA)
Pieman Dam (Tas)
Sandy Hollow Railway (NSW)
Jackson and Naccowlah Oil Field Development (SA)
Hammersley Iron (WA)
Port Augusta Power Station (SA)
Palmer to Port Augusta Transmission Line (SA)
Abbot Point Coal Loader, Bowen (Qld)
Northwest Shelf Gas Project (WA)
Argyle Diamond Mine (WA)
Albany, Geraldton, Esperance Wheat Silos (WA)
Copperlode Falls Dam (Qld)
Hume Highway – Benalla (Vic)
Liquid Petroleum Plant – Pt. Bonython (SA)
Adelaide/Alice Springs Railway (NT)
Drayton Coal Mine (NSW)
Mt. Rankin Rail Project (Qld)
Awoonga Dam (Qld)
Forestry Commission Roads (NSW)
Waitara Rail Project (Qld)
Brisbane Airport Redevelopment (Qld)
Harding River Dam (WA)
Avalon RAAF Base (Vic)
The new Parliament House (Canberra)
North Head Treatment Works (Sydney)
Darley Road Bridge (SA)
Perth Airport (WA)
The Loy Yang Power Station (La Trobe Valley, Vic)
Port Hedland Airport (WA)
Webb Dock Wharf (Melbourne)
Edinburgh Airport (SA)
Tom Ugly's Bridge (Sydney)
Winneke Reservoir (Yarra Glen, Vic)
Derby Defence Base (WA)
Tullamarine/Essendon Airports (Vic)
STA Bus Terminal (SA)
Fairford Road Overpass (Sydney)
Fort Hill Wharf (Darwin NT)
Melton Reservoir (Vic)
Port of Geraldton (WA)
Merrimu Reservoir (Vic)
Queensland Sugar Board, Sugar Terminal and Wharf (Brisbane)
America's Cup Marinas (WA)
Wanneroo Reservoir (WA)
Clinton Coal Loader (Qld)
Pearce Airforce Base (WA)
Hume Highway – upgrade (NSW)
Indian Pacific Railway (SA/WA)
Orange Grove Road upgrade (NSW)
Settlement Road Project (Vic)
Burnt Bridge Creek Diversion (Sydney)
Collector By-Pass (ACT)
Golden Grove Road (SA)
Berwick By-pass Freeway (Vic)
Grand Junction Road (Adelaide)
Warrigal/Darnum Freeway (La Trobe Valley, Vic)
F4 Freeway (NSW)
Mac's Reef Road (ACT)
King William Road (SA)
Wodonga By-pass (Vic)
Coober Pedy – Stuart Highway (SA)
Narrows Interchange (Perth)
Calder Freeway (Melbourne)
Mt. Henry Bridge (Perth)
Tullamarine Freeway (Melbourne)
Kwinana Freeway (Perth)
Mitchell Freeway (Perth)
Eyre Highway (WA)
Caloundra Interchange (Qld)



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Over more than forty years Comeng have conceived and produced '1st-s' for Australian railway networks and is proud of its reputation as the Nation's leading rolling stock designer, manufacturer and exporter.

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